

PROJECT MANUAL

TOWN OF CHESHIRE
CONNECTICUT



TOILET ROOM UPGRADES

DOOLITTLE ELEMENTARY SCHOOL
735 CORNWALL AVENUE
CHESHIRE, CT 06410

BID #2223-09
S/P+A PROJECT NO. 21.336

CD Submission Type: March 14, 2022
Issued for Bid: March 25, 2022
Issued for ReBid: October 31, 2022



Architects | Engineers | Interior Designers
Silver Petrucelli + Associates, Inc.
3190 Whitney Avenue, Hamden, CT 06518
311 State Street, New London, CT 06320

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LEGAL NOTICE

TOWN OF CHESHIRE, CONNECTICUT
INVITATION TO BID

Toilet Room Upgrades at Doolittle Elementary School
Bid #2223-09
October 31, 2022

The Town of Cheshire will receive sealed bids for the **Toilet Room Upgrades at Doolittle Elementary School** until November 30, 2022 at 10:00 AM. At that time bids will be opened, in public and read aloud.

There will be an optional site walk-through on Monday, November 7, 2022 at 3:30 PM at Doolittle Elementary School, 735 Cornwall Avenue, Cheshire, CT 06410, outside the Main Lobby.

The documents comprising the Invitation to Bid may be obtained on the Town's website, www.chshirect.org, under "Bids & RFPs".

The Town of Cheshire reserves the rights to amend or terminate this Invitation to Bid, accept all or any part of a bid, reject all bids, waive any informalities or non-material deficiencies in a bid, and award the bid to the bidder that, in the Town's judgment, will be in the Town's best interests.

TOWN OF CHESHIRE, CONNECTICUT

INVITATION TO BID

Toilet Room Upgrades at Doolittle Elementary School

Bid Number: 2223-09
Bid Opening Date: November 30, 2022
Bid Opening Time: 10:00 AM
Bid Opening Place: Cheshire Town Hall, Room 207

The Town of Cheshire is seeking bids for the TOILET ROOM UPGRADES AT DOOLITTLE ELEMENTARY SCHOOL as detailed in the “Specifications” section.

One (1) original, two (2) copies, and one (1) PDF (submitted on a thumb drive) of sealed bids must be received in the Cheshire Town Hall, Department of Public Works, Room 213, 84 South Main Street, Cheshire, CT 06410 by the date and time noted above. The Town of Cheshire (the “Town”) will not accept submissions by e-mail or fax. The Town will reject bids received after the date and time noted above.

The documents comprising the Invitation to Bid may be obtained on the Town’s website, www.cheshirect.org, under “Bids & RFPs”. **Each bidder is responsible for checking the Town’s website to determine if the Town has issued any addenda and, if so, to complete its bid in accordance with the Invitation to Bid as modified by the addenda.**

Bids must be held firm and cannot be withdrawn for sixty (60) calendar days after the opening date.

The Town reserves the rights to amend or terminate this Invitation to Bid, accept all or any part of a bid, reject all bids, waive any informalities or non-material deficiencies in a bid, and award the bid to the bidder that, in the Town’s judgment, will be in the Town’s best interests.

This Invitation to Bid (“ITB”) includes:

- Standard Instructions to Bidders
- Specifications
- Insurance Requirements
- Bid Form
- Bidder’s Legal Status Disclosure
- Bidder’s Certification Concerning Equal Employment Opportunities and Affirmative Action Policy
- Bidder’s Non-Collusion Affidavit
- Bidder’s Statement of References
- Addenda, if any
- The Contract in the form attached

TOWN OF CHESHIRE, CONNECTICUT
STANDARD INSTRUCTIONS TO BIDDERS

1. INTRODUCTION

The Town of Cheshire (the “Town”) is soliciting sealed bids for the TOILET ROOM UPGRADES AT DOOLITTLE ELEMENTARY SCHOOL as detailed in the Specifications section. This ITB is not a contract offer, and no contract will exist unless and until a written contract is signed by the Town and the successful bidder.

Interested parties should submit a bid in accordance with the requirements and directions contained in this ITB. **Bidders are prohibited from contacting any Town employee, officer, or official concerning this ITB, except as set forth in Section 6, below. A bidder’s failure to comply with this requirement may result in disqualification.**

If there are any conflicts between the provisions of these Standard Instructions to Bidders and any other documents comprising this ITB, these Standard Instructions to Bidders shall prevail.

2. RIGHT TO AMEND OR TERMINATE THE ITB OR CONTRACT

The Town may, before or after bid opening and in its sole discretion, clarify, modify, amend, or terminate this ITB if the Town determines it is in the Town’s best interest. Any such action shall be affected by a posting on the Town’s website, www.cheshirect.org, under “Bids and RFPs”. **Each bidder is responsible for checking the Town’s website to determine if the Town has issued any addenda and, if so, to complete its bid in accordance with the ITB as modified by the addenda.**

If this ITB provides for a multi-year agreement, the Town also reserve the right to terminate the Contract at the end of the last fiscal year for which funds have been appropriated, and the Town shall have no obligation or liability to the successful bidder for any unfunded year or years.

3. KEY DATES

Non-Mandatory Site Visit:	November 7, 2022 at 3:30 PM
Bid Opening:	November 30, 2022 at 10:00 AM
Preliminary Notice of Award:	December 14, 2022
Contract Execution:	December 16, 2022
Substantial Completion:	August 23, 2023

The Preliminary Notice of Award and Contract Execution dates are anticipated, not certain, dates.

4. OBTAINING THE ITB

All documents that are a part of this ITB may be obtained on the Town’s website, www.cheshirect.org, under “Bids and RFPs”.

5. BID SUBMISSION INSTRUCTIONS

Bids must be received in the Cheshire Town Hall, Department of Public Works, Room 213, 84 South Main Street, Cheshire, CT 06410 prior to the date and time the bids are scheduled to be opened publicly. Postmarks prior to the opening date and time do **NOT** satisfy this condition. The Town will

not accept submissions by e-mail or fax. Bidders are solely responsible for ensuring timely delivery. The Town will **NOT** accept late bids.

One (1) original, two (2) copies, and one (1) PDF (submitted on a thumb drive) of all bid documents must be submitted in sealed, opaque envelopes clearly labeled with the bidder's name, the bidder's address, the words "**BID DOCUMENTS,**" and the **Bid Title, Bid Number and Bid Opening Date.** The Town may decline to accept bids submitted in unmarked envelopes that the Town opens in its normal course of business. The Town may, but shall not be required to, return such bid documents, and inform the bidder that the bid documents may be resubmitted in a sealed envelope properly marked as described above.

Bid prices must be submitted on the Bid Form included in this ITB. All blank spaces for bid prices must be completed in ink or be typewritten; bid prices must be stated in both words and figures. The person signing the Bid Form must initial any errors, alterations, or corrections on that form. Ditto marks or words such as "SAME" shall not be used in the Bid Form.

Bids may be withdrawn personally or in writing provided that the Town receives the withdrawal prior to the time and date the bids are scheduled to be opened. Bids are considered valid, and may not be withdrawn, cancelled, or modified, for sixty (60) days after the opening date, to give the Town sufficient time to review the bids, investigate the bidders' qualifications, secure any required municipal approvals, and execute a binding contract with the successful bidder.

An authorized person representing the legal entity of the bidder must sign the Bid Form and all other forms included in this ITB.

6. QUESTIONS AND AMENDMENTS

Questions concerning this ITB are to be submitted **in writing** (including by e-mail or fax) and directed **only to:**

Name: Dan Bombero, Capital Projects Manager
Department: Public Works & Engineering
E-mail: dbombero@cheshirect.org
Fax: 203-271-6659

Bidders are prohibited from contacting any other Town employee, officer, or official concerning this ITB. A bidder's failure to comply with this requirement may result in disqualification.

The appropriate Town representative listed above must receive any questions from bidders no later than seven (7) business days before the bid opening date. That representative will confirm receipt of a bidder's questions by e-mail. The Town will answer all written questions by issuing one (1) or more addenda, which shall be a part of this ITB and the resulting Contract, containing all questions received as provided for above and decisions regarding same.

At least four (4) calendar days prior to bid opening, the Town will post any addenda on the Town's website, www.cheshirect.org, under "Bids & RFPs". **Each bidder is responsible for checking the website to determine if the Town has issued any addenda and, if so, to complete its bid in accordance with the ITB as modified by the addenda.**

No oral statement of the Town, including oral statements by the Town representatives listed above, shall be effective to waive, change, or otherwise modify any of the provisions of this ITB, and no bidder shall rely on any alleged oral statement.

7. ADDITIONAL INFORMATION

The Town reserves the right, either before or after the opening of bids, to ask any bidder to clarify its bid or to submit additional information that the Town in its sole discretion deems desirable.

8. COSTS FOR PREPARING BID

Each bidder's costs incurred in developing its bid are its sole responsibility, and the Town shall have no liability for such costs.

9. OWNERSHIP OF BIDS

All bids submitted become the Town's property and will not be returned to bidders.

10. FREEDOM OF INFORMATION ACT

All information submitted in a bid or in response to a request for additional information is subject to disclosure under the Connecticut Freedom of Information Act as amended and judicially interpreted. A bidder's responses may contain financial, trade secret, or other data that it claims should not be public (the "Confidential Information"). A bidder must identify specifically the pages and portions of its bid or additional information that contain the claimed Confidential Information by visibly marking all such pages and portions. Provided that the bidder cooperates with the Town as described in this section, the Town shall, to the extent permitted by law, protect from unauthorized disclosure such Confidential Information.

If the Town receives a request for a bidder's Confidential Information, it will promptly notify the bidder in writing of such request and provide the bidder with a copy of any written disclosure request. The bidder may provide written consent to the disclosure, or may object to the disclosure by notifying the Town in writing to withhold disclosure of the information, identifying in the notice the basis for its objection, including the statutory exemption(s) from disclosure. The bidder shall be responsible for defending any complaint brought in connection with the nondisclosure, including but not only appearing before the Freedom of Information Commission, and providing witnesses and documents as appropriate.

11. REQUIRED DISCLOSURES

In its Bid Form, each bidder must disclose, if applicable:

- Its inability or unwillingness to meet any requirement of this ITB, including but not only any of the Contract Terms contained in Section 26, below;
- If it is listed on the State of Connecticut's Debarment List;
- If it is ineligible, pursuant to Conn. Gen. Stat. § 31-57b, to be awarded the Contract because of occupational safety and health law violations;
- All resolved and pending arbitrations and litigation matters in which the bidder or any of its principals (regardless of place of employment) has been involved within the last seven (7) years;

- All criminal proceedings in which the bidder or any of its principals (regardless of place of employment) has ever been the subject; and
- Each instance in which it or any of its principals (regardless of place of employment) has ever been found to have violated any state or local ethics law, regulation, ordinance, code, policy, or standard, or to have committed any other offense arising out of the submission of proposals or bids or the performance of work on public works projects or contracts.

A bidder's acceptability based on these disclosures lies solely in the Town's discretion.

12. REFERENCES

Each bidder must complete and submit the Bidder's Statement of References form included in this ITB.

13. LEGAL STATUS

If a bidder is a corporation, limited liability company, or other business entity that is required to register with the Connecticut Secretary of the State's Office, it must have a current registration on file with that office. The Town may, in its sole discretion, request acceptable evidence of any bidder's legal status.

14. BID SECURITY

Each bid must be accompanied by a certified check of the bidder or a bid bond with a surety acceptable to the Town in an amount equal to at least **TEN PERCENT (10%)** of the bid amount. The bid bond shall be written by a company or companies licensed to issue bonds in the State of Connecticut, which company or companies shall have at least an "A-" VIII policyholders rating as reported in the latest edition of Best Publication's Key Rating Guide. The successful bidder, upon its refusal or failure to execute and deliver the Contract, certificate(s) of insurance, W-9 form, performance security, or other documents required by this ITB within **ten (10) business days** of written notification of preliminary award, unless the Town otherwise agrees in writing, shall forfeit to the Town, as liquidated damages for such failure or refusal, the security submitted with its bid.

Upon the successful bidder's execution of the Contract in the form enclosed with this ITB, the Town shall return the bid security to the successful bidder and to all other bidders.

15. PRESUMPTION OF BIDDER'S FULL KNOWLEDGE

Each bidder is responsible for having read and understood each document in this ITB and any addenda issued by the Town. A bidder's failure to have reviewed all information that is part of or applicable to this ITB, including but not only any addenda posted on the Town's website, shall in no way relieve it from any aspect of its bid or the obligations related thereto.

Each bidder is deemed to be familiar with and is required to comply with all federal, state, and local laws, regulations, ordinances, codes, and orders that in any manner relate to this ITB or the performance of the work/provisions of the items described herein.

By submitting a bid, each bidder represents that it has thoroughly examined and become familiar with the scope of work/requested items outlined in this ITB, and it is capable of performing the work/providing the items to achieve the Town's objectives. If applicable, each bidder shall visit the

site, examine the areas, and thoroughly familiarize itself with all conditions of the property before preparing its bid.

16.SUBSTITUTIONS

The bidder must attach detailed information concerning deviations from any name brands specified in the ITB and explain in detail how the substitution compares with the name brand's specifications. The Town in its sole discretion shall decide whether the substitution is acceptable.

17.TAX EXEMPTIONS

The Town is exempt from the payment of federal excise taxes and Connecticut sales and use taxes. Federal Tax Exempt #066-001971. Exemption from State sales tax per Conn. Gen. Stat. Chapter 219, § 12-412(1). No exemption certificates are required, and none will be issued.

18.INSURANCE

The successful bidder shall, at its own expense and cost, obtain and keep in force at least the insurance listed in the Insurance Requirements that are a part of this ITB. The Town reserves the right to request from the successful bidder a complete, certified copy of any required insurance policy.

19.PERFORMANCE SECURITY

The successful bidder shall furnish a performance bond covering the faithful performance of the Contract (the "Performance Security"). The Performance Security shall be in an amount equal to the contract price, and in a form reasonably acceptable to the Town. The performance bond shall be issued by a company licensed by the State of Connecticut that has at least an "A-" VIII policyholders rating according to Best Publication's latest edition Key Rating Guide." The cost of the Performance Security shall be included in the bid price.

In addition to the Performance Security, the successful bidder shall furnish a bond covering the successful bidder's payment to its subcontractors and suppliers of all obligations arising under the Contract (the "Payment Bond"). The Payment Bond shall be (a) in the full amount of the Contract price; (b) in a form reasonably acceptable to the Town; and (c) issued by a company licensed by the State of Connecticut that has at least an "A-" VIII policyholders rating according to Best Publication's latest edition Key Rating Guide. The cost of the Payment Bond shall be included in the proposal price.

20.DELIVERY ARRANGEMENTS

The successful bidder shall deliver the item(s) that are the subject of the ITB, at its sole cost and expense, to the location(s) listed in the Specifications.

21.AWARD CRITERIA; SELECTION; CONTRACT EXECUTION

All bids will be publicly opened and read aloud as received on the date, at the time, and at the place identified in this ITB. Bidders may be present at the opening.

The Town reserves the right to correct, after bidder verification, any mistake in a bid that is a clerical error, such as a price extension, decimal point error or FOB terms. If an error exists in an extension of prices, the unit price shall prevail. In the event of a discrepancy between the price quoted in words and in figures, the words shall control.

The Town reserves the rights to accept all or any part of a bid, reject all bids, and waive any informalities or non-material deficiencies in a bid. The Town also reserves the right, if applicable, to award the purchase of individual items under this ITB to any combination of separate bids or bidders.

The Town will accept the bid that, all things considered, the Town determines is in its best interests. Although price will be an important factor in most ITBs, it will not be the only basis for award. Due consideration may also be given to a bidder's experience, references, service, ability to respond promptly to requests, past performance, and other criteria relevant to the Town's interests, including compliance with the procedural requirements stated in this ITB.

The Town will not award the bid to any business that or person who is in arrears or in default to the Town with regard to any tax, debt, contract, security, or any other obligation.

If the lowest bidder meets all specifications, is responsive, and, if applicable, qualified, but the bid is not acceptable to the Town Manager or, if applicable, the Public Building Commission or the Board of Education, the matter must be referred to the Town Council for its decision on whether to reject all bids, to accept a higher bid, or to take such other action as may be in the Town's best interests.

The Town will select the bid that it deems to be in the Town's best interest and issue a Preliminary Notice of Award to the successful bidder. The award may be subject to further discussions with the bidder. **The making of a preliminary award to a bidder does not provide the bidder with any rights and does not impose upon the Town any obligations. The Town is free to withdraw a preliminary award at any time and for any reason. A bidder has rights, and the Town has obligations, only if and when a Contract is executed by the Town and the bidder.**

If the bidder does not execute the Contract within ten (10) business days of the date of the Preliminary Notice of Award, unless extended by the Town, the Town may call any bid security provided by the bidder and may enter into discussions with another bidder.

The Preliminary Notice of Award and Contract Execution dates in Section 3's Key Dates are anticipated, not certain, dates.

22. AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY

Each bidder must submit a completed Bidder's Certification Concerning Equal Employment Opportunities and Affirmative Action Policy form included with this ITB. Bidders with fewer than ten (10) employees should indicate that fact on the form and return the form with their bids.

23. NONRESIDENT REAL PROPERTY CONTRACTORS

Not Applicable.

24. COMPLIANCE WITH IMMIGRATION LAWS

By submitting a bid, each bidder confirms that it has complied, and during the term of the Contract will comply, with the Immigration Reform and Control Act ("IRCA") and that each person it provides under the Contract will at all times be authorized for employment in the United States of America. Each bidder also confirms that it has a properly completed Employment Eligibility Verification, Form I-9, for each person who will be assigned under the Contract and that it will require each subcontractor, if any, to confirm that it has a properly completed Form I-9 for each person who will be assigned under the Contract.

The successful bidder shall defend, indemnify, and hold harmless the Town, its employees, officers, officials, agents, volunteers, and independent contractors, including any of the foregoing sued as individuals (collectively, the “Town Indemnified Parties”), against any and all proceedings, suits, actions, claims, damages, injuries, awards, judgments, losses or expenses, including fines, penalties, punitive damages, attorney’s fees and costs, brought or assessed against, or incurred by, the Town Indemnified Parties related to or arising from the obligations under IRCA imposed upon the successful bidder or its subcontractor. The successful bidder shall also be required to pay any and all attorney’s fees and costs incurred by the Town Indemnified Parties in enforcing any of the successful bidder’s obligations under this provision, whether or not a lawsuit or other proceeding is commenced, which obligations shall survive the termination or expiration of the Contract.

25. NON-COLLUSION AFFIDAVIT

Each bidder shall submit a completed Bidder’s Non-Collusion Affidavit that is part of this ITB.

26. MUNICIPAL PUBLIC WORKS CONTRACT REQUIREMENTS

Not Applicable.

27. CONTRACT TERMS

A contract template has been provided with this Invitation to Bid. By submitting a bid, the Bidder acknowledges and agrees that it will execute the contract submitted to it for execution by the Town, without alteration or modification by the Bidder, within five (5) days of receipt of the Notice of Award. The following provisions will be mandatory terms of the Town’s Contract with the successful bidder. If a bidder is unwilling or unable to meet any of these Contract Terms, the bidder must disclose that inability or unwillingness in its Bid Form (see Section 11 of these Standard Instructions to Bidders):

a. DEFENSE, HOLD HARMLESS, AND INDEMNIFICATION

The successful bidder agrees, to the fullest extent permitted by law, to defend, indemnify, and hold harmless the Town, its employees, officers, officials, agents, volunteers and independent contractors, including any of the foregoing sued as individuals (collectively, the “Town Indemnified Parties”), from and against all proceedings, suits, actions, claims, damages, injuries, awards, judgments, losses, or expenses, including attorney’s fees, arising out of or relating, directly or indirectly, to the successful bidder’s malfeasance, misconduct, negligence, or failure to meet its obligations under the ITB or the Contract. The successful bidder’s obligations under this section shall not be limited in any way by any limitation on the amount or type of the successful bidder’s insurance. Nothing in this section shall obligate the successful bidder to indemnify the Town Indemnified Parties against liability for damage arising out of bodily injury to persons or damage to property caused by or resulting from the negligence of the Town Indemnified Parties.

In any and all claims against the Town Indemnified Parties made or brought by any employee of the successful bidder, or anyone directly or indirectly employed or contracted with by the successful bidder, or anyone for whose acts or omissions the successful bidder is or may be liable, the successful bidder’s obligations under this section shall not be limited by any limitation on the amount or type of damages, compensation, or benefits payable by the successful bidder under workers’ compensation acts, disability benefit acts, or other employee benefits acts.

The successful bidder shall also be required to pay any and all attorney's fees incurred by the Town Indemnified Parties in enforcing any of the successful bidder's obligations under this section, which obligations shall survive the termination or expiration of this ITB and the Contract.

As a municipal agency of the State of Connecticut, the Town will NOT defend, indemnify, or hold harmless the successful bidder.

b. ADVERTISING

The successful bidder shall not name the Town in its advertising, news releases, or promotional efforts without the Town's prior written approval.

If it chooses, the successful bidder may list the town in a Statement of References or similar document required as part of its response to a public procurement. The Town's permission to the successful bidder to do so is not a statement about the quality of the successful bidder's work or the Town's endorsement of the successful bidder.

c. W-9 FORM

The successful bidder must provide the Town with a completed W-9 form before Contract execution.

d. PAYMENTS

Bidders are encouraged to offer discounts for early payment. All other payments are to be made thirty (30) days after the appropriate Town employee receives and approves the invoice, unless otherwise specified in the Specifications.

"In each of its contracts with subcontractors or materials suppliers, the successful bidder shall agree to pay any amounts due for labor performed or materials furnished not later than thirty (30) days after the date the successful bidder receives payment from the Town that encompasses the labor performed or materials furnished by such subcontractor or material supplier. The successful bidder shall also require in each of its contracts with subcontractors that such subcontractor shall, within thirty (30) days of receipt of payment from the successful bidder, pay any amounts due any sub-subcontractor or material supplier, whether for labor performed or materials furnished.

Each payment application or invoice shall be accompanied by a statement showing the status of all pending change orders, pending change directives and approved changes to the Contract. Such statement shall identify the pending change orders and pending change directives, and shall include the date such change orders and change directives were initiated, additional cost and/or time associated with their performance and a description of any work completed. The successful bidder shall require each of its subcontractors and suppliers to include a similar statement with each of their payment applications or invoices".

e. TOWN INSPECTION OF WORK

The Town may inspect the successful bidder's work or products at all reasonable times. This right of inspection is solely for the Town's benefit and does not transfer to the Town the

responsibility for discovering patent or latent defects. The successful bidder has the sole and exclusive responsibility for performing in accordance with the Contract.

f. REJECTED WORK OR MATERIALS

The successful bidder, at its sole cost and expense, shall remove from the Town's property rejected items, commodities and/or work within 48 hours of the Town's notice of rejection. Immediate removal may be required when safety or health issues are present.

g. MAINTENANCE AND AVAILABILITY OF RECORDS

The successful bidder shall maintain all records related to the Contract for a period of five (5) years after final payment under the Contract or until all pending Town, state and federal audits are completed, whichever is later. Such records shall be available for examination and audit by Town, state, and federal representatives during that time.

h. SUBCONTRACTING

Prior to entering into any subcontract agreement(s) for the work described in the Contract, the successful bidder shall provide the Town with written notice of the identity (full legal name, street address, mailing address (if different from street address), and telephone number) of each proposed subcontractor. The Town shall have the right to object to any proposed subcontractor by providing the successful bidder with written notice thereof within seven (7) business days of receipt of all required information about the proposed subcontractor. If the town objects to a proposed subcontractor, the successful bidder shall not use that subcontractor for performance of any portion of the Contract.

All permitted subcontracting shall be subject to the same terms and conditions as are applicable to the successful bidder. The successful bidder shall remain fully and solely liable and responsible to the Town for performance of the Contract. The successful bidder also agrees to promptly pay each of its subcontractors within thirty (30) days of receipt of payment from the Town or otherwise in accordance with law. The successful bidder shall assure compliance with all requirements of the Contract. The successful bidder shall also be fully and solely responsible to the Town for the acts and omissions of its subcontractors and of persons employed, whether directly or indirectly, by its subcontractor(s).

i. PREVAILING WAGES

State law may require that wages paid on an hourly basis to any person performing the work of any mechanic, laborer or worker under the Contract and the amount of payment or contribution paid or payable on behalf of each such person to any employee welfare fund, as defined in Conn. Gen. Stat. § 31-53, as amended, shall be at a rate equal to the rate customary or prevailing for the same work in the same trade or occupation in the Town. A successful bidder who is not obligated by agreement to make payment or contribution on behalf of such persons to any such employee welfare fund shall pay to each mechanic, laborer, or worker as part of such person's wages the amount of payment or contribution for such person's classification on each pay day. Upon Contract award, the successful bidder must certify under oath to the State Labor Commissioner the pay scale to be used by the successful proposer and its subcontractors.

j. PREFERENCES

The successful bidder shall comply with the requirements of Conn. Gen. Stat. § 31-52(b), as amended. Specifically, the successful bidder agrees that in the employment of labor to perform the Contract, preference shall be given to citizens of the United States who are, and have been continuously for at least three (3) months prior to the date of the Contract, residents of the labor market area (as established by the State of Connecticut Labor Commissioner) in which such work is to be done, and if no such qualified person is available, then to citizens who have continuously resided in New Haven County for at least three (3) months prior to the date hereof, and then to citizens of the State who have continuously resided in the State at least three (3) months prior to the date of the Contract.

k. WORKERS COMPENSATION

Prior to Contract execution, the Town will require the tentative successful bidder to provide a current statement from the State Treasurer that, to the best of the State Treasurer's knowledge and belief, as of the date of the statement, the tentative successful bidder was not liable to the State for any workers' compensation payments made pursuant to Conn. Gen. Stat. § 31-355.

l. SAFETY

The successful bidder and each of its permitted subcontractors shall furnish proof that each employee performing the work of a mechanic, laborer or worker under the Contract has completed a course of at least 10 hours in construction safety and health approved by the federal Occupational Safety and Health Administration or has completed a new miner training program approved by the Federal Mine Safety and Health Administration. Such proof shall be provided with the certified payroll submitted for the first week each such employee, mechanic, laborer, or worker begins work under the Contract.

m. COMPLIANCE WITH LAWS

The successful bidder shall comply with all applicable laws, regulations, ordinances, codes and orders of the United States, the State of Connecticut and the Town related to its bid and the performance of the work described in the Contract.

n. LICENSES AND PERMITS

The successful bidder certifies that, throughout the Contract term, it shall have and provide proof of all approvals, permits, and licenses required by the Town and/or any state or federal authority. The successful bidder shall immediately and in writing notify the Town of the loss or suspension of any such approval, permit, or license.

o. AMENDMENTS

The Contract may not be altered or amended except by the written agreement of both parties.

p. ENTIRE AGREEMENT

It is expressly understood and agreed that the Contract contains the entire agreement between the parties, and that the parties are not, and shall not be, bound by any stipulations,

representations, agreements or promises, oral or otherwise, not printed or inserted in the Contract or its attached exhibits.

q. VALIDITY

The invalidity of one (1) or more of the phrases, sentences, or clauses contained in the Contract shall not affect the remaining portions so long as the material purposes of the Contract can be determined and effectuated.

r. CONNECTICUT LAW AND COURTS

The Contract shall be governed by and construed in accordance with the internal laws (as opposed to the conflicts of law provisions) of the State of Connecticut, and the parties irrevocably submit in any suit, action, or proceeding arising out of the Contract to the jurisdiction of the United States District Court for the District of Connecticut or of any court of the State of Connecticut, as applicable.

s. NON-EMPLOYMENT RELATIONSHIP

The Town and the successful bidder are independent parties. Nothing contained in the Contract shall create, or be construed or deemed as creating, the relationships of principal and agent, partnership, joint venture, employer, and employee, and/or any relationship other than that of independent parties contracting with each other solely for the purpose of carrying out the terms and conditions of the Contract. The successful bidder understands and agrees that it is not entitled to employee benefits, including but not limited to workers' compensation and employment insurance coverage, and disability. The successful bidder shall be solely responsible for any applicable taxes.

END OF STANDARD INSTRUCTIONS TO BIDDERS

TOWN OF CHESHIRE, CONNECTICUT

INSURANCE REQUIREMENTS
TOILET ROOM UPGRADES AT DOOLITTLE ELEMENTARY SCHOOL
BID #2223-09

Vendor shall maintain in force at all times during which services are to be performed by vendor, or such longer period as provided by contract, the following coverages placed with company(ies) licensed by the State of Connecticut which have at least an “A-” VIII policyholders rating according to A.M. Best's latest edition Key Rating Guide. The stated policy limits are the minimum coverage amounts required.

		(Minimum Limits)
General Liability*	Each Occurrence	\$1,000,000
	General Aggregate	\$2,000,000
	Products/Completed Operations Aggregate	\$2,000,000
Auto Liability*	Combined Single Limit	
	Each Accident	\$1,000,000
Professional Liability*	Each Claim or Each Occurrence	\$1,000,000
	Aggregate	\$2,000,000
Umbrella* (Excess Liability)	Each Occurrence	\$1,000,000
	Aggregate	\$1,000,000

*The Town of Cheshire, and its Board of Education (if applicable), shall be named as “Additional Insured.” Coverage is to be provided on a primary, noncontributory basis. Waiver of subrogation must be provided. High limits may be required, based on the scope and nature of the services to be provided. If higher limits are required, such limits shall be identified in the Invitation to Bid, as well as in the contract issued by the Town. The Town reserves the right to require additional coverages, including, without limitation, Builder’s Risk insurance for construction projects and Owner’s Protective Liability insurance, if desirable.

If any policy is written on a “Claims Made” basis, the policy must be continually renewed for a minimum of two (2) years from the completion date of this Contract. If the policy is replaced and/or the retroactive date is changed, then the expiring policy must be endorsed to extend the reporting period for claims for the policy in effect during the Contract for two (2) years from the completion date.

Workers’ Compensation and Employer’s Liability	WC Statutory Limits
EL Each Accident	\$500,000
EL Disease Each Employee	\$500,000
EL Disease Policy Limit	\$500,000

Original, completed Certificates of Insurance must be presented to the Town’s Purchasing Agent prior to purchase order issuance and Contract execution. Vendor agrees to provide replacement/renewal certificates at least sixty (60) days prior to the expiration of the policy. Should any of the above-described policies be cancelled before the expiration date, written notice must be provided to the Town thirty (30) days prior to cancellation. Failure to maintain required insurance coverage shall be a material default of vendor’s contract with the Town.

END OF INSURANCE REQUIREMENTS

TOWN OF CHESHIRE, CONNECTICUT

BID FORM
TOILET ROOM UPGRADES AT DOOLITTLE ELEMENTARY SCHOOL
BID #2223-09

BIDDER'S FULL LEGAL NAME: _____

Pursuant to and in full compliance with the ITB, the undersigned bidder, having visited the site or property if applicable, and having thoroughly examined each and every document comprising the ITB, including any addenda, hereby offers and agrees as follows:

To provide the products and/or services specified in, and upon the terms and conditions of, the ITB for the total sum of _____

_____ Dollars (\$) .00)

written figure

Alternates:

The undersigned proposes to furnish all Labor, Materials, Equipment and Services necessary to construct the items listed in the Alternates described in Section 012300 for the stipulated sums.

ADD ALTERNATE #1: Classroom 14 Toilet Room Work: Add to the Base Bid a total of

_____ Dollars (\$) .00)

written figure

The project schedule will be increased by _____ calendar days to complete the work indicated under Add Alternate 1.

ADD ALTERNATE #2: Classroom 15 Toilet Room Work: Add to the Base Bid a total of

_____ Dollars (\$) .00)

written figure

The project schedule will be increased by _____ calendar days to complete the work indicated under Add Alternate 2.

ALTERNATE #3: Voluntary Alternate

For the work, methods, procedures, or materials referenced below, we propose to (Add/Deduct) from the Base Bid a total of

_____ Dollars (\$) .00)

written figure

The project schedule will be (added) (decreased) by _____ calendar days to complete the work indicated under Alternate 3.

Voluntary Alternate Summary Description: _____

Unit Prices:

As required by the Base Bid, should deteriorated or damaged materials be required to be removed as determined by the Architect or Owner, the cost to remove and replace the referenced material, (or credit for specified material not provided or installed) including all labor, material, equipment, and related furnishings is as follows:

Item	Description	Unit Price
1.	Add wood blocking, as specified, cut to fit around roof structure and systems installed	\$ bf
2.	Deduct wood blocking, as specified, cut to fit around roof structure and system installed	\$ bf
3.	Domestic water shut-off valve, provision and installation	\$ each

Addenda:

The undersigned acknowledges receipt of the following addenda to the Contract Documents, listed by number and date:

Number , Dated: _____
Number , Dated: _____

Number , Dated: _____
Number , Dated: _____

Exceptions:

ACKNOWLEDGEMENT

In submitting this Bid Form, the undersigned bidder acknowledges that the price(s) include all labor, materials, transportation, hauling, overhead, fees and insurances, bonds or letters of credit, profit, security, permits and licenses, and all other costs to cover the completed work or to provide the items called for in the ITB. Except as otherwise expressly stated in the ITB, no additional payment of any kind will be made for work accomplished or the items provided under the price(s) as proposed.

REQUIRED DISCLOSURES

1. Exceptions to the ITB

_____ This bid does not take exception to any requirement of the ITB, including but not only any of the Contract Terms set forth in Section 26 of the Standard Instructions to Bidders.

OR

_____ This bid takes exception(s) to certain of the ITB requirements, including but not only the following Contract Terms set forth in Section 26 of the Standard Instructions to Bidders. **Attached is a sheet fully describing each such exception.**

2. State Debarment List

Is the bidder on the State of Connecticut's Debarment List?

_____ Yes
_____ No

3. Occupational Safety and Health Law Violations

Has the bidder or any firm, corporation, partnership, or association in which it has an interest (1) been cited for three (3) or more willful or serious violations of any occupational safety and health act or of any standard, order, or regulation promulgated pursuant to such act, during the three-year period preceding the bid (provided such violations were cited in accordance with the provisions of any state occupational safety and health act or the Occupational Safety and Health Act of 1970, and not abated within the time fixed by the citation and such citation has not been set aside following appeal to the appropriate agency or court having jurisdiction) or (2) received one (1) or more criminal convictions related to the injury or death of any employee in the three-year period preceding the bid?

_____ Yes
_____ No

If "yes," attach a sheet fully describing each such matter.

4. Arbitration/Litigation

Has either the bidder or any of its principals (regardless of place of employment) been involved for the most recent ten (10) years in any resolved or pending arbitration or litigation?

_____ Yes
_____ No

If "yes," attach a sheet fully describing each such matter.

5. Criminal Proceedings

Has the bidder or any of its principals (regardless of place of employment) ever been the subject of any criminal proceedings?

_____ Yes
_____ No

If "yes," attach a sheet fully describing each such matter.

6. Ethics and Offenses in Public Projects or Contracts

Has either the bidder or any of its principals (regardless of place of employment) ever been found to have violated any state or local ethics law, regulation, ordinance, code, policy, or standard, or to have committed any other offense arising out of the submission of a proposals or bids or the performance of work on public works projects or contracts?

_____ Yes
_____ No

If “yes,” attach a sheet fully describing each such matter.

BID SECURITY

The bidder has included herein the required certified check or bid bond in the amount of ten percent (10%) of the bid amount.

NOTE: THIS DOCUMENT, IN ORDER TO BE CONSIDERED A VALID BID, MUST BE SIGNED BY A PRINCIPAL OFFICER OR OWNER OF THE BUSINESS ENTITY THAT IS SUBMITTING THE BID. SUCH SIGNATURE CONSTITUTES THE BIDDER’S REPRESENTATIONS THAT IT HAS READ, UNDERSTOOD, AND FULLY ACCEPTED EACH AND EVERY PROVISION OF EACH DOCUMENT COMPROMISING THE ITB, UNLESS AN EXCEPTION IS DESCRIBED ABOVE.

BY _____ TITLE: _____
(PRINT NAME) _____

(SIGNATURE) _____ DATE: _____

END OF BID FORM

TOWN OF CHESHIRE, CONNECTICUT

BIDDER'S LEGAL STATUS DISCLOSURE

Please fully complete the applicable section below, attaching a separate sheet if you need additional space.

For purposes of this disclosure, "permanent place of business" means an office continuously maintained, occupied, and used by the bidder's regular employees regularly in attendance to carry on the bidder's business in the bidder's own name. An office maintained, occupied, and used by a bidder only for the duration of a contract will not be considered a permanent place of business. An office maintained, occupied, and used by a person affiliated with a bidder will not be considered a permanent place of business of the bidder.

IF A SOLELY OWNED BUSINESS:

Bidder's Full Legal Name _____

Street Address _____

Mailing Address (if different from Street Address) _____

Owner's Full Legal Name _____

Number of years engaged in business under sole proprietor or trade name _____

Does the bidder have a "permanent place of business" in Connecticut, as defined above?

_____ Yes _____ No

If yes, please state the full street address (not a post office box) of that "permanent place of business."

IF A CORPORATION:

Bidder's Full Legal Name _____

Street Address _____

Mailing Address (if different from Street Address) _____

Owner's Full Legal Name _____

Number of years engaged in business _____

Names of Current Officers

President Secretary Chief Financial Officer

Does the bidder have a "permanent place of business" in Connecticut, as defined above?

_____ Yes _____ No

If yes, please state the full street address (not a post office box) of that "permanent place of business."

IF A LIMITED LIABILITY COMPANY:

Bidder's Full Legal Name _____

Street Address _____

Mailing Address (if different from Street Address) _____

Owner's Full Legal Name _____

Number of years engaged in business _____

Names of Current Manager(s) and Member(s)

Name & Title (if any)

Residential Address (street only)

Name & Title (if any)

Residential Address (street only)

Name & Title (if any)

Residential Address (street only)

Name & Title (if any)

Residential Address (street only)

Name & Title (if any)

Residential Address (street only)

Does the bidder have a "permanent place of business" in Connecticut, as defined above?

_____ Yes _____ No

If yes, please state the full street address (not a post office box) of that "permanent place of business."

IF A PARTNERSHIP:

Bidder's Full Legal Name _____

Street Address _____

Mailing Address (if different from Street Address) _____

Owner's Full Legal Name _____

Number of years engaged in business _____

Names of Current Partners

Name & Title (if any)

Residential Address (street only)

Name & Title (if any)

Residential Address (street only)

Name & Title (if any)

Residential Address (street only)

Name & Title (if any)

Residential Address (street only)

Name & Title (if any)

Residential Address (street only)

Does the bidder have a "permanent place of business" in Connecticut, as defined above?

_____ Yes _____ No

If yes, please state the full street address (not a post office box) of that "permanent place of business."

Bidder's Full Legal Name

(print)

Name and Title of Bidder's Authorized Representative

(signature)

Bidder's Representative, Duly Authorized

Date

END OF LEGAL STATUS DISCLOSURE FORM

TOWN OF CHESHIRE, CONNECTICUT

TOILET ROOM UPGRADES AT DOOLITTLE ELEMENTARY SCHOOL
BID #2223-09

BIDDER'S CERTIFICATION

Concerning Equal Employment Opportunities and Affirmative Action Policy

I/we, the bidder, certify that:

- 1) I/we are in compliance with the equal opportunity clause as set forth in Connecticut state law (Executive Order No. Three, <http://www.cslib.org/exeorder3.htm>).
- 2) I/we do not maintain segregated facilities.
- 3) I/we have filed all required employer's information reports.
- 4) I/we have developed and maintain written affirmative action programs.
- 5) I/we list job openings with federal and state employment services.
- 6) I/we attempt to employ and advance in employment qualified handicapped individuals.
- 7) I/we are in compliance with the Americans with Disabilities Act.
- 8) I/we (check one):
 have an Affirmative Action Program, or
 employ ten (10) people or fewer.

Legal Name of Bidder

(signature)

Bidder's Representative, Duly Authorized

Name of Bidder's Authorized Representative

Title of Bidder's Authorized Representative

Date

END OF BIDDER'S CERTIFICATION FORM

TOWN OF CHESHIRE, CONNECTICUT

TOILET ROOM UPGRADES AT DOOLITTLE ELEMENTARY SCHOOL
BID #2223-09

BIDDER'S NON-COLLUSION AFFIDAVIT

The undersigned bidder, having fully informed himself/herself/itself regarding the accuracy of the statements made herein, certifies that:

- (1) the bid is genuine; it is not a collusive or sham bid;
- (2) the bidder developed the bid independently and submitted it without collusion with, and without any agreement, understanding, communication or planned common course of action with, any other person or entity designed to limit independent competition;
- (3) the bidder, its employees and agents have not communicated the contents of the bid to any person not an employee or agent of the bidder and will not communicate the bid to any such person prior to the official opening of the bid; and
- (4) no elected or appointed official or other officer or employee of the Town of Cheshire is directly or indirectly interested in the bidder's bid, or in the supplies, materials, equipment, work, or labor to which it relates, or in any of the profits thereof.

The undersigned bidder further certifies that this affidavit is executed for the purpose of inducing the Town of Cheshire to consider its bid and make an award in accordance therewith.

Legal Name of Bidder

(signature)

Bidder's Representative, Duly Authorized

Name of Bidder's Authorized Representative

Title of Bidder's Authorized Representative

Date

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

Notary Public
My Commission Expires:

END OF BIDDER'S NON-COLLUSION AFFIDAVIT

TOWN OF CHESHIRE, CONNECTICUT

TOILET ROOM UPGRADES AT DOOLITTLE ELEMENTARY SCHOOL
BID #2223-09

BIDDER'S STATEMENT OF REFERENCES

Provide at least three (3) references:

- 1. BUSINESS NAME _____
ADDRESS _____
CITY, STATE _____
TELEPHONE _____
INDIVIDUAL CONTACT NAME AND POSITION _____

- 2. BUSINESS NAME _____
ADDRESS _____
CITY, STATE _____
TELEPHONE _____
INDIVIDUAL CONTACT NAME AND POSITION _____

- 3. BUSINESS NAME _____
ADDRESS _____
CITY, STATE _____
TELEPHONE _____
INDIVIDUAL CONTACT NAME AND POSITION _____

END OF STATEMENT OF REFERENCES



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 2022
(In words, indicate day, month, and year.)

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

Town of Cheshire
84 South Main Street
Cheshire, CT 06410
and the Contractor:

(Name, legal status, address, and other information)

for the following Project:
(Paragraph Deleted)

Toilet Room Upgrades: Doolittle Elementary School
735 Cornwall Avenue
Cheshire CT 06410

The Architect:
(Paragraph Deleted)

Silver/Petrucci + Associates, Inc.
3190 Whitney Avenue
Hamden, CT 06518

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.

Init.

The Owner and Contractor agree as follows.
(Paragraph Deleted)

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, the Bidding Documents (including Owner's Instructions to Bidders, Owner's Invitation to Bid #2122-11 and all Bidding Documents issued in conjunction therewith, including Addenda thereto), Contractor's Bid dated _____, 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.

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 or Architect. Contractor shall coordinate the scheduling and performance of the Work with the Owner.

Established as follows:

(Insert a date or a means to determine the date of commencement of the Work.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

Init.

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User Notes:

(3B9ADA37)

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 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 ___ (___) months from the date of commencement of the Work.

By the following date: August 23, 2022

TIME IS OF THE ESSENCE WITH REGARD TO THE TIMELY PERFORMANCE OF THE AGREEMENT, ACHIEVEMENT OF ALL MILESTONES, SUBSTANTIAL COMPLETION AND FINAL COMPLETION OF THE PROJECT BY THE CONTRACTOR. If, in the sole opinion of the Owner, the Contractor is not adhering to the Project schedule and/or is not supplying sufficient labor and/or equipment to complete the Work by the Substantial Completion date contained herein, upon 48 hours written notice, the Town shall have the right to direct the Contractor to increase its labor and/or equipment to meet established project schedules without additional compensation provided the Town is not responsible or in any way liable for the Contractor not adhering to the Project schedule. Any and all such additional labor or supervision shall be at Contractor's sole cost and expense and may include, but shall not be limited to, Town directing the Contractor to increase the workers on its crews, supply additional equipment, work overtime, work a second shift during a single day, work weekends, or any combination thereof, without any additional compensation being due to Contractor for such additional personnel. Any costs incurred or arising due to the Contractor's failure to achieve timely Substantial Completion shall be borne solely by the Contractor.

§ 3.3.1.1 Contractor expressly agrees, notwithstanding any provision in this Agreement to the contrary, that: (i) a COVID-19 pandemic exists worldwide as of the execution date of this Agreement; (ii) the existence of such pandemic, and its effects, now, and for the duration of Contractor's performance under the Agreement, shall not in and of itself be cause for Contractor to rely upon, invoke, or avail itself to, any rights or remedies under this Agreement, at law, or in equity, for a claim, or an adjustment to the price, schedule, quantities, specifications, or other material terms of this Agreement; (iii) the material terms of this Agreement, particularly terms relating to price, schedule, quantities, availability and specifications, take into consideration, and fully account for, the existence of such pandemic and its effects, as of the date of this Agreement; and (iv) such pandemic shall not render Contractor unable to fulfill any of its obligations under the Agreement, and Contractor shall not have any claim, action, or cause of action against the Owner in connection with such pandemic, including any claim for frustration of purpose change in circumstances, economic balance, or impossibility. This provision shall survive the completion or earlier termination of this Agreement.

§ 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:

Init.

Item	Price
As indicated in the Bid Proposal	

§ 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
N/A		

§ 4.3 Allowances, if any, included in the Contract Sum: *(Identify each allowance.)*

Item	Price
As indicated in the Bid Proposal	

§ 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)
As indicated in the Bid Proposal		

§ 4.5 Liquidated damages, if any: *(Insert terms and conditions for liquidated damages, if any.)*

See A201 as modified.

§ 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 25th day of a month, the Owner shall make payment of the amount certified to the Contractor not later than thirty (30) days after the Owner approves the Application for Payment. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than thirty (30) days after the approves the Application for Payment certified by the Architect. *(Federal, state, or local laws may require payment within a certain period of time.)*

§ 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.

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§ 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;
- .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.)

Five percent (5%)

§ 5.1.7.1.1 The following items are not subject to retainage:

(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

N/A

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:

(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

At the Owner's sole discretion.

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:

(Insert any other conditions for release of retainage upon Substantial Completion.)

Owner shall be entitled to retain two hundred percent (200%) of the estimated cost to complete punch list items to reach Final Completion.

§ 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.

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§ 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 and all conditions precedent to final payment have been satisfied.

§ 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:

§ 5.3 Intentionally Deleted.

(Paragraphs Deleted)

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 subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, 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 court of competent jurisdiction

Other *(Specify)*

Litigation in Connecticut Superior Court in and for the Judicial District of New Haven unless the Owner, in its sole discretion, elects to arbitrate a dispute.

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

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| (Paragraph Deleted)

| Intentionally Deleted.

§ 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.

§ 8.2 The Owner’s representative:
(Name, address, email address, and other information)

| To be named by the Owner in writing within ten (10) days of the execution of this Agreement.

§ 8.3 The Contractor’s representative:
(Name, address, email address, and other information)

| To be named by the Contractor in writing within ten (10) days of the execution of this Agreement.

§ 8.4 Neither the Owner’s nor the Contractor’s representative shall be changed without ten days’ prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and 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.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Other provisions:

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, as modified
- .4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:

(Insert the date of the E203-2013 incorporated into this Agreement.)

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.5 Drawings Dated March 14, 2022

Number	Title	Date
See List of Drawings		

.6 Specifications

Section	Title	Date	Pages
See Table of Contents			

.7 Addenda, if any:

Number	Date	Pages
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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.)

(Paragraphs Deleted)

(Table Deleted)

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.)

Town of Cheshire, Project Manual, dated 3/14/2022, including all Addenda
Instructions to Bidders, AIA A701, and Supplemental Instructions to Bidders
State of CT, Prevailing Wage Rates
Contractor's Bid Proposal
Town of Cheshire – Doolittle Elementary School Toilet Room Upgrades Drawings and Specifications dated 3/14/2022

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)



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 **AIA** Document A201® – 2017**General Conditions of the Contract for Construction****for the following PROJECT:***(Name and location or address)*

Toilet Room Upgrades: Doolittle Elementary School
735 Cornwall Avenue
Cheshire CT 06410

THE OWNER:*(Name, legal status and address)*

Town of Cheshire
84 South Main Street
Cheshire, CT 06410

THE ARCHITECT:*(Paragraph Deleted)*

Silver/Petrucci + Associates, Inc.
3190 Whitney Avenue
Hamden, CT 06518

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- 13 MISCELLANEOUS PROVISIONS**
- 14 TERMINATION OR SUSPENSION OF THE CONTRACT**

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.

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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, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, the Bidding Documents (including the Owner's Project Manual for Invitation to Bid #2122-11, including the Project Drawings and Specifications and accompanying documents), Contractor's Bid Proposal, 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. Unless specifically enumerated in the Agreement, the Contract Documents do not include sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, or portions of Addenda relating to bidding or proposal requirements.

§ 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. Subcontractors are not intended thirty-party beneficiaries to the Contract and shall have no direct cause of action against the Owner.

In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities:

- .1 Modifications, with those of later date having precedence over those of earlier date.
- .2 The Agreement, including any amendment to the Agreement included in the bid package.
- .3 Addenda to the Specifications and Drawings, with those of later date having precedence over those of earlier date.
- .4 The General Conditions of the Contract for Construction.
- .5 Specifications and Drawings.

Further, stated dimensions shall take precedence over scaled dimensions; large-scale detail drawings shall take precedence over small-scale drawings; schedules shall take precedence over other data on the drawings.

In the case of an inconsistency between Drawings and Specifications or within either Document in describing the Work, the better quality, greater quantity, or more costly work shall be provided in accordance with the Architect's interpretation.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether performed on or off the site of the Project and whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor, its Subcontractors, Sub-Subcontractors, material suppliers or any other entity for whom the Contractor is responsible to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 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.

§ 1.1.6 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 Contractor's Standard of Care

The Contractor shall be responsible for the performance of the Work as an independent contractor and in a good and workmanlike manner (i) consistent with the Contract Documents; (ii) consistent with the instructions, guidance and direction of the Owner and Architect; (iii) consistent with the highest prevailing applicable professional or industry standards; (iv) consistent with sound practices; (v) as expeditiously as is consistent with such professional skill and care and the orderly progress of the Work and with the Contract Documents and the instructions, guidance and direction of the Owner and Architect; (vi) in a manner that will not exceed the Contract Sum as set forth in the Agreement, and (vii) in strict compliance with applicable laws (the standards of this Section 1.1.8 shall be referred to herein as the "Contractor's Standard of Care"). The Contractor shall exercise the Contractor's Standard of Care in performing all aspects of the Work. All references in the Contract Documents to the knowledge, inference, reliance, awareness, determination, belief, observation, recognition or discovery of the Contractor or reference to any similar term shall include the constructive knowledge, inference, reliance, awareness, determination, belief, observation and recognition attributed to the Contractor ("constructive knowledge"). Such constructive knowledge shall include the knowledge, inference, reliance, awareness, determination, belief, observation and recognition the Contractor would have obtained upon the exercise of the Contractor's Standard of Care.

§ 1.1.9 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 Before ordering materials or doing any Work, the Contractor and each Subcontractor shall verify measurements at the Project site and shall be responsible for the correctness of such measurements. No extra charge or compensation will be allowed on account of minor differences between actual dimensions and the dimensions indicated on the Drawings. Any difference which may be found shall be submitted to the Architect for resolution before proceeding with the Work.
- .2 If a minor change in the Work is found necessary due to actual field conditions, the Contractor shall submit detailed drawings of such departure for the approval by the Architect before making the change.
- .3 The Architect may, as he deems desirable, issue additional drawings or instructions indicating in greater detail the construction or design of the various parts of the Work reasonably inferable from the Contract Documents; such drawings or instructions may be affected by notice to the Contractor without modification of the contract Time or contract Sum. If the Contractor claims additional cost or delay on account of such additional drawings or instructions, he shall give notice as provided in Subparagraph 15.1.
- .4 The invalidity of any provision 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.

§ 1.2.3 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.

§ 1.2.4 The Contractor and all Subcontractors shall refer to all of the Drawings, including those showing primarily the Work of the mechanical, electrical and other specialized trades, and to all of the sections of the Specifications, and shall perform all Work reasonably inferable there from as being necessary to produce the indicated results.

§ 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 Instruments of Service, including the Drawings and Specifications, are and shall be the property of the Owner. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or 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 reserved rights of the Owner.

§ 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 for any purpose outside the scope of the Work without the specific written consent of the Owner

§ 1.5.3 Prior to execution of the Agreement, the Contractor evaluated and satisfied itself as to the condition and limitations under which the Work is to be performed, including, without limitation, (i) the location, condition, layout, and nature of the Project site and surrounding areas, (ii) generally prevailing climatic conditions, (iii) anticipated labor supply and costs, (iv) availability and cost of materials, tools, and equipment, and (v) other similar issues. The Owner assumes no responsibility or liability for the physical condition or safety of the Project site or any improvements located on the Project site. The Contractor shall be solely responsible for providing a safe place for the performance of the Work. The Owner shall not be required to make any adjustment in either the Contract Sum or the Contract Time in connection with any failure by the Contractor or any Subcontractor to have complied with the requirements of this Subparagraph 1.5.3.

§ 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 Building Information Models 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, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, 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)

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1.9 Any information obtained by the Contractor from the Owner or Architect may not be used, published, distributed, sold or divulged by the Contractor or its Subcontractor or Sub-subcontractors for such party's own purposes or for the benefit of any person, firm, corporation or other entity other than the Owner, without the **prior written consent of the Owner**. Any information obtained by the Contractor of its Subcontractors or Sub-Subcontractors that is designated by the Owner in accordance with applicable law as confidential shall not be disclosed to any other parties without the prior written consent of the Owner.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 INTENTIONALLY OMITTED

§ 2.1.2 INTENTIONALLY OMITTED

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 INTENTIONALLY OMITTED

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities. The Owner has agreed to waive the fees of all required building permits related to the completion of this project

§ 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.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

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§ 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 fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, 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 seven-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. The Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15. The Owner's right to stop the Work is in addition to and not in restriction or derogation of any and all remedies available to the Owner. The Owner shall have full access to and the right to inspect all portions of the Work for quality, progress, and conformance of the Contract Documents. Any testing or inspections (including commissioning) performed by or on behalf of the Owner shall in no way relieve or replace the obligations of the Contractor in its fulfillment of its obligations hereunder. Any commissioning activities are at the sole discretion of the Owner and shall not be a requirement of the Agreement.

§ 2.6 In no event shall the Owner have control over, charge or any responsibility for construction means, methods, techniques, sequences, or procedures or for safety precautions and programs in connection with the Work, notwithstanding any of the rights and authority granted the Owner in the Contract Documents.

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 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.

§ 3.1.2 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.

§ 3.1.4 The Contractor shall comply with the Conditions and all local, state, and federal laws, rules and regulations applicable to the Contractor, including without limitation those relating to equal opportunity, labor, wage (including prevailing wage laws) and employment.

§ 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, conducted its own due diligence, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary and extensive, 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. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for

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the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. 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.

. The exactness of grades, elevations, dimensions, or locations given on any Drawings issued by the Architect, or surveys furnished by the Owner, is not guaranteed by the Architect or the Owner. The Contractor shall, therefore, satisfy itself as to the accuracy of all grades, elevations, dimensions, and locations. Any errors due to the Contractor's failure to so verify all such grades, elevations, dimensions, or locations shall be promptly rectified by the Contractor without any additional cost to the Owner.

§ 3.2.3 Owner assumes no contractual liability or responsibility for the physical condition or safety of the Project site or of any improvement thereon. Except as set forth in Section 10.3, the Contractor shall be solely responsible for providing a safe place for the performance of the Work.

§ 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 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. . If the Contractor or a Subcontractor fails to submit a Claim in accordance with the requirements of Article 15, the Contractor or Subcontractor knowingly and irrevocably waives any Claim for additional compensation or time.

§ 3.2.5 The Contractor shall give the Architect timely notice of any additional Drawings, Specifications, or instructions required to define the Work in greater detail, or to permit the proper progress of the Work.

§ 3.2.6 The Contractor shall not proceed with any Work not clearly and consistently defined in detail in the Contract Documents, but shall request additional drawings or instructions from the Architect as provided in subparagraph 3.2.5. If the Contractor proceeds with such Work without obtaining further Drawings, Specifications or instructions, the Contractor shall correct Work incorrectly done at the Contractor's own expense.

§ 3.2.7 Except as to any reported errors, inconsistencies or omissions, and as to any concealed or unknown conditions as defined in Paragraph 3.7.4. by executing the Agreement, the Contractor represents the following:

- .1 The Contract Documents are sufficiently complete and detailed for the Contractor to (1) perform the Work required to produce the results intended by the Contract Documents and (2) comply with all the 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 product manufacturers are consistent with: (1) good and sound practices within the construction industry; (2) generally prevailing and accepted industry standards applicable to the Work; and (3) requirements of any warranties applicable to the Work.

§ 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.

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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.

§ 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 The Contractor shall schedule and perform the Work so as not to unreasonably interfere with any other related or unrelated work being performed by the Owner in or about the Project premises or with the Owner's continued use and operation of the Project premises as a fully operational school. The Contractor shall protect and prevent damage to all unfinished phases of the Work.

§ 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.

§ 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 Approval by the Owner or Architect of any such substitution shall not relieve the Contractor requesting the substitution of responsibility for any additional costs incurred by other trades for changes made necessary to accommodate the substituted item.

§ 3.4.2.2 By making requests for substitutions based on subparagraph 3.4.2 above, the Contractor:

- .1 represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;
- .2 represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;
- .3 certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect's redesign costs, and waives all claims for additional costs related to substitution which subsequently become apparent; and
- .4 shall coordinate the installation of the accepted substitution, making such changes as may be required for the Work to be complete in all respects.

§ 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 shall be responsible for determining that all materials furnished for the Work meet all requirements of the Contract Documents. The Architect may require the Contractor to produce reasonable evidence that a material meets such requirements, such as certified reports of past tests by qualified testing laboratories, reports of studies by qualified experts, or other evidence which, in the opinion of the Architect, would lead to a reasonable certainty that any material used, or proposed to be used, in the Work meets the requirements of the Contract Documents. All such data shall be furnished at the Contractor's expense.

§ 3.4.5 In all cases in which a manufacturer's name, trade name or other proprietary designation is used in connection with materials or articles to be furnished under this Contract, the Contractor shall furnish the product of the named manufacturer(s) without substitution.

§ 3.4.6 The Contractor shall only employ or use labor in connection with the Work capable of working harmoniously with all trades, crafts, and any other individuals associated with the Project. The Contractor shall also use best efforts to minimize the likelihood of any strike, work stoppage, or other labor disturbance.

§ 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.

§ 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 Contractor agrees to assign to the Owner as a condition precedent to Substantial Completion of the Work any and all manufacturer's warranties relating to materials and equipment installed in the Work and further agrees to perform the Work in such manner so as to preserve any and all such manufacturer's warranties.

§ 3.5.4 The warranty provided in this Paragraph 3.5 shall be in addition to and not in limitation of any other warranty or guaranty required by the Contract Documents or otherwise prescribed by law.

§ 3.5.5 The Contractor shall procure and deliver to the Architect, no later than thirty (30) calendar days after the Date of Substantial Completion, all warranties required by the Contract Documents.

§ 3.5.6 The Warranty shall include the repair and/or replacement of all damaged materials resulting from the defective materials and/or workmanship. This shall include but not be limited to furniture, fixtures, equipment, finishes or any other affected materials or property.

§ 3.6 Taxes

The Owner is a tax-exempt entity. The Contractor shall be familiar with the current regulations of the Connecticut Department of Revenue Services and the sales or use tax on materials or supplies exempted by such regulations shall not be included as part of the bid or the Contract Sum. A sales tax certificate is available upon written request.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure the building permit as well as for other permits, licenses, and inspections by government agencies necessary for proper execution and completion of the Work, including, without limitation, all building permits, subsidiary trade permits, and occupancy permits. All inspection fees as may be imposed by any municipal agency are waived by the Owner.

§ 3.7.1.1 The "Agencies" are the Department of Public Works for the Town of Cheshire (the "Department"), and all other governmental authorities having regulatory or administrative jurisdiction over the Work and/or Project and all representatives or designees of the Department or such other governmental authorities. The term "Agencies" shall also include an individuals or entities designated by the Owner to monitor or oversee compliance of the Project's design with the requirements of **governmental authorities having jurisdiction over the Project.**

§ 3.7.1.2 The term "Agencies" shall also include an individual or entity not described in Section 3.7.1.1 from whom the Owner intends to request certification of the Project's design, to the extent included in the Contract Documents.

§3.7.1.3 Non-Discrimination and Affirmative Action Provisions

The Contractor agrees and warrants that in the performance of the Contract the Contractor will not discriminate or permit discrimination against any person or group of persons on the grounds of race, color, religious creed, age, marital status, national origin, ancestry, sex, gender identity or expression, sexual orientation, intellectual disability, mental disability or physical disability, including, but not limited to, blindness, unless it is shown by such

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Contractor that such disability prevents performance of the work involved, in any manner prohibited by the laws of the United States or of the state of Connecticut. The Contractor further agrees to take affirmative action to ensure that applicants with job-related qualifications are employed and that employees are treated when employed without regard to of race, color, religious creed, age, marital status, national origin, ancestry, sex, gender identity or expression, intellectual disability, mental disability or physical disability, including, but not limited to, blindness, unless it is shown by such Contractor that such disability prevents performance of the work involved; (2) the Contractor agrees, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, to state that it is an "affirmative action-equal opportunity employer" in accordance with regulations adopted by the commission; (3) the Contractor agrees to provide each labor union or representative of workers with which such Contractor has a collective bargaining agreement or other contract or understanding and each vendor with which such Contractor has a contract or understanding, a notice to be provided by the commission advising the labor union or workers' representative of the Contractor's commitments under this section, and to post copies of the notice in conspicuous places available to employees and applicants for employment; (4) the Contractor agrees to comply with each provision of this section and sections 46a-68e and 46a-68f and with each regulation or relevant order issued by said commission pursuant to sections 46a-56, 46a-68e, 46a-68f and 46a-86; (5) the Contractor agrees to provide the Commission on Human Rights and Opportunities with such information requested by the commission, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of the Contractor as relate to the provisions of this section and section 46a-56.

Any Contractor who is a party to a municipal public works contract or quasi-public agency project, where any such contract is valued at less than \$50,000 for each year of the contract, shall provide the Commission on Human Rights and Opportunities with a written or electronic representation that complies with the nondiscrimination agreement and warranty under subsection (A)(1) above, provided if there is any change in such representation, the Contractor shall provide the updated representation to the Commission not later than 30 days after such change. Any Contractor who is a party to a municipal public works contract or a quasi-public agency project, where any such contract is valued at \$50,000 or more for any year of the contract, shall provide the Commission with any one of the following: (1) Documentation in the form of a company or corporate policy adopted by resolution of the board of directors, shareholder, managers, members or other governing body of such Contractor that complies with the nondiscrimination agreement and warranty under subsection (A)(1) of this section; (2) Documentation in the form of a company or corporate policy adopted by a prior resolution of the board of directors, shareholders, managers, members or other governing body of such Contractor if (a) the prior resolution is certified by a duly authorized corporate officer of such contractor to be in effect on the date the documentation is submitted, and the executive director of the Commission on Human Rights and Opportunities or designee certifies that the prior resolution complies with the nondiscrimination agreement and warranty under subdivision (A)(1) of this section; or (3) Documentation in the form of an affidavit signed under penalty of false statement by a chief executive officer, president, chairperson or other corporate officer duly authorized to adopt company or corporate policy that certifies that the company or corporate policy of the contractor complies with the nondiscrimination agreement and warranty under subdivision (A)(1) of this section and is in effect on the date the affidavit is signed.. The Contractor shall include the provisions hereof in every subcontract or purchase order entered into to fulfill any obligation of a municipal public works contract or contract for a quasi-public agency project, and such provisions shall be binding on a Contractor, vendor or manufacturer, unless exempted by regulations or orders of the Commission on Human Rights and Opportunities. The Contractor shall take such action with respect to any such subcontract or purchase order as the Commission may direct as a means of enforcing such provisions, including sanctions for noncompliance in accordance with section 46a-56; provided, if such Contractor becomes involved in, or is threatened with, litigation with a Contractor or vendor as a result of such direction by the Commission regarding a state contract, the contractor may request the state of Connecticut to enter into any such litigation or negotiation prior thereto to protect the interests of the state and the state may so enter.

"Minority business enterprise" means any small contractor or supplier of materials fifty-one per cent or more of the capital stock, if any, or assets of which is owned by a person or persons: (1) Who are active in the daily affairs of the enterprise, (2) who have the power to direct the management and policies of the enterprise and (3) who are members of a minority, as such term is defined in subsection (a) of section 32-9n; and "good faith" means that degree of diligence which a reasonable person would exercise in the performance of legal duties and obligations. "Good faith efforts" shall include, but not be limited to, those reasonable initial efforts necessary to comply with statutory or regulatory requirements and additional or substituted efforts when it is determined that such initial efforts will not be sufficient to comply with such requirements. Determination of the Contractor's good faith efforts shall include, but shall not be eliminated to, the following factors: The Contractor's employment and subcontracting policies, patterns and practices; affirmative advertising recruitment and training; technical assistance activities and

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such other reasonable activities or efforts as the Commission on Human Rights and Opportunities may prescribe that are designed to ensure the participation of minority business enterprises in municipal public works contracts or quasi-public agency projects. "Municipal public works project" means that portion of an agreement entered into on or after October 1, 2015, between any individual, firm or corporation and a municipality for the construction, rehabilitation, conversion, extension, demolition or repair of a public building, highway or other changes or improvements in real property, which is financed in whole or in part by the state, including, but not limited to, matching expenditures, grants, loans, insurance or guarantees but excluding any project of an alliance district, as defined in section 10-262u, finance by the state funding in an amount equal to fifty thousand dollars or less. "Quasi-public agency project" means the construction, rehabilitation, conversion, extension, demolition or repair of a building or other changes or improvements in real property pursuant to a contract entered into on or after October 1, 2015, which is financed in whole or in part by a quasi-public agency using state funds, including, but not limited to, matching expenditures, grants, loans, insurance or guarantees.

§ 3.3.7.1.4 If this Project is being funded in whole or in part with State of Connecticut funds, the Contractor must comply with CONN. GEN. STAT. §§ 4a-60, 4a-60a, 4a-60g, and 46a-68b through 46a-68f, inclusive, as amended by June 2015 Special Session e Commission on Human Rights he commencement of construction. State law requires a minimum of twenty-five (25%) percent of the state-funded portion of the contract for award to Contractors holding current certification from the Connecticut Department of Administrative Services ("DAS") under the provisions of CONN. GEN. STAT. § 4a-60g, as amended. (25% of the work with DAS certified Small and Minority owned businesses and 25% of that work with DAS certified Minority, Women and/or Disabled owned businesses.) The contractor must demonstrate good faith effort to meet the 25% set-aside goals. For municipal public works contracts and quasi-public agency projects, the contractor must file a written or electronic non-discrimination certification with the Commission on Human Rights and Opportunities. Forms can be found at: http://www.ct.gov/opm/cwp/view.asp?a=2982&q=390928&opmNav_GID=1806.

§ 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. The Contractor shall procure and obtain all bonds required of the Owner or the Contractor by the municipality in which the Project is located or any public or private body with jurisdiction over the Project. In connection with such bonds, the Contractor shall prepare all applications, supply all necessary backup material, and furnish the surety with any required personal undertakings. The Owner will pay the price of all such bond premiums.

§ 3.7.3 If the Contractor performs Work which it knows or should know is contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall bear 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 written 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

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Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.7.6 If any governmental body having jurisdiction over the Work requires licenses or registrations for the performance of the Work or any part thereof, the Contractor shall hold such valid licenses or registrations as may be required by law to prosecute the Work to completion. If any part of the Work for which such a license or registration is required is to be performed by Subcontractors of any tier, the Contractor shall ensure that such Subcontractors hold such valid licenses or registrations as may be required by law to prosecute said Work to completion.

§ 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;
- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- .3 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 competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. 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 Owner or 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 objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.9.4 The Contractor shall coordinate and supervise the Work performed by Subcontractors to the end that the Work is carried out without conflict between trades and so that no trade, at any time, causes delay to the general progress of the Work. The Contractor and all Subcontractors shall at all times afford each trade, any separate contractor, or the Owner, every reasonable opportunity for the installation of Work and the storage of materials.

§ 3.9.5 Contractor shall at all times enforce strict discipline and good order among its employees (and those of its Subcontractors) and shall not employ on the Work any unfit person or anyone not skilled in the task assigned to them. All labor shall be performed by workmen skilled in their respective trades and workmanship shall be of good quality in accordance with the standards of construction set forth in the Contract Documents.

§ 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 and approval a Contractor's construction schedule for the Work. The schedule shall contain detail

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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. The schedule shall set forth milestone dates agreed to by the parties and the failure of the Contractor to achieve a milestone shall constitute a material default hereunder. Failure to meet a milestone date shall entitle but not require the Owner to supplement the Contractor's forces, at the sole cost and expense of the Contractor, and the Contractor shall be solely responsible for coordinating its efforts with and supervising the work of any supplemental manpower.

§ 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 construction schedule shall be in a detailed precedence-style critical path management ("CPM") format satisfactory to the Owner and the Architect that shall also (i) provide a graphic representation of all activities and events that will occur during performance of the Work; (ii) identify each phase of construction and occupancy; and (iii) set forth dates that are critical in ensuring the timely and orderly completion of the Work in accordance with the requirements of the Contract Documents (hereinafter referred to as "Milestone Dates"). Upon review and acceptance by the Owner and the Architect of the Milestone Dates, the construction schedule shall be deemed part of the Contract Documents. If not accepted, the construction schedule shall be promptly revised by the Contractor in accordance with the recommendations of the Owner and the Architect and resubmitted for acceptance. The Contractor shall monitor the progress of the Work for conformance with the requirements of the construction schedule and shall promptly advise the Owner of any delays or potential delays. The accepted construction schedule shall be updated to reflect actual conditions, as set forth in Subparagraph 3.10.1 or if requested by either the Owner or the Architect. In the event any progress report indicates any delays, the Contractor shall propose an affirmative plan to correct the delay, including overtime and/or additional labor, if necessary. In no event shall any progress report constitute an adjustment in the Contract Time, any Milestone Date, or the Contract Sum unless any such adjustment is agreed to by the Owner and authorized pursuant to Change Order.

§ 3.10.5 In the event the Owner determines that the performance of the Work, as of a Milestone Date, has not progressed or reached the level of completion required by the Contract Documents, the Owner shall have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction, including, without limitation, (i) working additional shifts or overtime, (ii) supplying additional manpower, equipment, and facilities, and (iii) other similar measures (hereinafter referred to collectively as "Extraordinary Measures"). Such Extraordinary Measures shall continue until the progress of the Work complies with the stage of completion required by the Contract Documents. The Owner's right to require Extraordinary Measures is solely for the purpose of ensuring the Contractor's compliance with the construction schedule.

- .1 The Contractor shall not be entitled to an adjustment in the Contract Sum in connection with Extraordinary Measures required by the Owner under or pursuant to this Subparagraph 3.10.5.
- .2 The Owner may exercise the rights furnished the Owner under or pursuant to this Subparagraph 3.10.5 as frequently as the Owner deems necessary to ensure that the Contractor's performance of the Work will comply with the completion date set forth in the Contract Documents.

§ 3.10.6 The Owner shall have the right to direct a postponement or rescheduling of any date or time for the performance of any part of the Work that may interfere with the operation of the Owner's premises or any invitees thereof. The Contractor shall, upon the Owner's request, reschedule any portion of the Work affecting operation of the premises during hours when the premises are in operation. Any postponement or rescheduling under Subparagraph 3.10.5. may be grounds for an extension of the Contract Time if permitted under Subparagraph 8.3.1.

§ 3.10.7 The Contractor shall schedule and conduct construction and progress meetings, on a frequency required to effect coordination, to discuss such matters as procedures, progress, problems, and scheduling. The Contractor shall prepare and distribute minutes within three working days of such meetings.

§ 3.10.8 The Contractor shall record the progress of the Project, including information on each Subcontractor and each Subcontractor's Work, as well as the entire Project, showing percentages of completion and the number and amounts of Change Orders. The Contractor will keep a daily log containing a record of weather, Subcontractors' Work on the site, number of workers, Work accomplished, problems encountered and other similar relevant data as the Owner may require. Upon request, Contractor shall make the logs available to the Owner and the Architect.

§ 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 how 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. The Contractor's approval shall be noted on the submitted item or in its transmittal letter, together with written notice of any deviation in the submitted item from the requirements of the Work and of the Contract Documents. In collaboration with the Architect, Contractor shall establish and implement procedures for expediting the processing and approval of Shop Drawings, Product Data, Samples, and other submittals.

§ 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. Each Shop Drawing, Product Data, Sample, and similar submittals shall have a cover sheet identifying the project name and address, contractor information, drawing and/or specification reference, submission date and contents of the submittal. Ample space shall be provided on this cover sheet to allow for the Contractor's and Architect's review stamps. The Contractor's approval shall be noted on the submitted items or in its transmittal letter, together with written notice of any deviation in the submitted item from the requirements of the Work and of the Contract Documents.

§ 3.12.6 By submitting and approving 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. The Contractor shall indicate approval on the submittals as evidence of such review and coordinate submittals made to the Architect without such indications of approval may be returned to the Contractor

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for resubmission. The accuracy of all such information is the responsibility of the Contractor. In approving Shop Drawings, Product Data, Samples, and similar submittals, the Architect shall be entitled to rely upon the Contractor's representation that such information is accurate and in compliance with the Contract.

§ 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. If the Contractor procures, performs, or installs portions of the Work without required approvals, the Contractor does so at its own risk and such Work may be removed or replaced with approved Work at no cost to the Owner.

§ 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 notified the Architect 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. Any submittals forwarded to the Architect for review that include a deviation from the requirements of the Contract Documents or is not the specific make, model or manufacturer that was listed in the Contract Documents shall have a completed Substitution Request Form attached to the submittal. This Substitution Request Form shall be provided by the Owner. Unless such deviation is identified by utilizing the Substitution Request Form, the Contractor shall not be relieved of the responsibility for the specific requirements of the Contract Documents even though the subject submittal was approved by the Architect. The Contractor shall not be relieved of responsibility for the Contractor's subcontractor's or vendor's 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 notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional who shall have and maintain reasonable limits of insurance, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner 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.

.2 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.

.3 Services provided by the Architect to evaluate Contractor product substitution requests or to review shop drawings or other project submittals which are required to be submitted more than three (3) times shall be paid for by the Contractor to the Owner.

§ 3.13 Use of Site

§ 3.13.1 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.

§ 3.13.2 Only materials and equipment that are to be used directly in the Work shall be brought to and stored on the Project site by the Contractor. After equipment is no longer required for the Work, it shall be promptly removed from the Project site. Protection of construction materials and equipment stored at the Project site from weather, theft, damage, and all other adversity is solely the responsibility of the Contractor. The Contractor shall ensure that the Work, at all times, is performed in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent areas. The Work shall be performed, to the fullest extent reasonably possible, in such a manner that occupied areas adjacent to the site of the Work shall at all time remain free from all debris and building materials.

§ 3.13.3 Other than those reasonably required for safety purposes, the Contractor and any entity for whom the Contractor is responsible shall not erect any sign on the Project site without the prior written consent of the Owner, which may be withheld in the sole discretion of the Owner.

§ 3.13.4 Without limitation of any other provision of the Contract Documents, the Contractor shall use best efforts to minimize any interference with the occupancy or beneficial use of any areas and buildings adjacent to the site of the Work. Without prior written approval of the Owner, the Contractor shall not permit any workers to use any existing facilities at the Project site, including, without limitation, lavatories, toilets, entrances, and parking areas other than those designated by the Owner.

§ 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 and shall clean and/or remove all stains, spots, work, blemishes, foreign matter and dirt from other surfaces not part of the Work but where such conditions resulted from the Contractor's operations.

§ 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 for the full cost of such cleanup.

§ 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, defend and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages,

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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 that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 The Contractor's indemnity obligations under this Paragraph 3.18 shall also specifically include, without limitation, all fines, penalties, damages, liability, costs, expenses (including, without limitation, reasonable attorneys' fees), and punitive damages (if any) arising out of, or in connection with, any (i) violation of or failure to comply with any law, statute, ordinance, rule, regulation, code, or requirement of a public authority that bears upon the performance of the Work by the Contractor, a Subcontractor, or any person or entity for whom either is responsible, (ii) means, methods, procedures, techniques, or sequences of execution or performance of the Work, and (iii) failure to secure and pay for permits, fees, approvals, licenses, and inspections as required under the Contract Documents, or any violation of any permit or other approval of a public authority applicable to the Work, by the Contractor, a Subcontractor, or any person or entity for whom either is responsible.

§ 3.18.3 The Contractor acknowledges that the subject property upon which the Project is being performed is not lienable because it is municipal government property used for governmental purposes. The Contractor shall indemnify, defend and hold harmless the Owner and the Architect against any and all mechanic's liens placed on the premises or on Owner's interest in the premises by any Subcontractor of any tier or material supplier. In the event that a Subcontractor of any tier or material supplier places a mechanic's lien on the premises, the Contractor shall, with thirty (30) days of the filing of any mechanic's lien, substitute a bond for such lien or cause the lien to be discharged. If the Contractor shall fail to do so, the Owner may, at its option and at the expense of the Contractor, bond such lien or cause the lien to be discharged, and the Contractor will reimburse the Owner for all costs and expenses incurred, including but not limited to attorneys' fees and court costs.

§ 3.18.4 The Contractor shall indemnify, defend, and hold harmless the Owner and the Architect from and against any additional costs or expenses incurred by Owner, including attorneys' fees and court costs, as a result of any claim or cause of action by any Subcontractor or supplier of any tier asserted directly against the Owner to recover payment for labor or materials supplied to the Project, unless such claim or cause of action arises from the failure of the Owner to make payments in accordance with the applicable provisions of the Contract Documents.

§ 3.18.5 The Contractor shall indemnify and hold harmless the Owner, its agents and employees from and against any costs and expenses, including attorneys' fees and court costs, incurred in enforcing any of the Contractor's defense, indemnity, and hold harmless obligations under this Contract.

§ 3.18.6 The Contractor, for itself, its insurers and all subcontractors and their insurers, shall waive governmental immunity as a defense and shall not use the defense of governmental immunity in the adjustment of claims or in the defense of any suit, action or claim brought against the Owner. Nothing herein shall limit the Owner from utilizing the defense of governmental immunity.

§ 3.19 MEETINGS

The Contractor shall send a qualified representative to periodic progress meetings held at such time and at such place as the Architect or the Owner shall designate in accordance with the Contract Documents and to such other meetings as are necessary to comply with 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.

§ 4.2 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, (i) until the final payment is due, (ii) from time to time during the one year period described in Section 12.2, and (iii) while review or certification of the Project from any of the Agencies is pending.. The Architect will have authority to act on behalf of the Owner only to the extent specified 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.

§ 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 through 13.4.4, whether or not the Work is fabricated, installed or completed.

§ 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 assuring conformity 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.

§ 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 Documents 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 The Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 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 these interpretations or decisions rendered in good faith which were necessitated by a reason other than an act or omission of the Architect.

§ 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. Requests for information shall include, at a minimum, a detailed written statement that indicates the specific element of the Contract Documents in need of clarification and the nature of the clarification requested. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

§ 4.2.15 Each Subcontract executed by the Contractor shall include language that instructs the Subcontractor that the Subcontractor is to submit written information requests regarding Contract Document interpretation only to the Contractor and not the Architect. The Contractor shall timely review each such information request and only as necessary, submit to the Architect any information request that in the Contractor's professional judgment is not clearly and unambiguously answered in the Contract Documents.

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, as soon as practicable 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

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receipt of the information, the Owner or Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) either requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.1.1 To facilitate and expedite the investigations of such proposed persons or entities, the Contractor shall submit a statement in writing in sufficient detail to establish that each has the capacity to carry out the portion of the Work such person or entity is proposing to provide. All such submittals shall include a list of principal personnel of any such entity, and an analysis of the financial condition, construction plant, equipment and facilities of any such person or entity. The Contractor shall terminate, at no cost to Owner, any contract with a person or entity to whom the Owner has a reasonable objection if such proposed and rejected subcontractor or such terminated.

§ 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.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 If the Contractor proposes to substitute a Subcontractor, person, or entity for one previously selected, the parties shall follow the procedures outlined in Section 5.2.1.

§ 5.3 Subcontractual Relations

§ 5.3.1 Any part of the Work performed for the Contractor by a Subcontractor shall be pursuant to a written Subcontract between the Contractor and Subcontractor, which shall be prepared on a form of Subcontract reasonably satisfactory to the Owner in all respects. The Owner shall be a third party beneficiary of all contracts between the Contractor and Subcontractor and all such contracts shall require that the Owner be a third party beneficiary of all contracts between Subcontractors and Sub-Subcontractors. Copies of all Subcontractor bids or proposals shall, upon request of Owner, be submitted to the Owner and Architect.

§ 5.3.2 By appropriate agreement, written where legally required for validity, 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, which the Contractor, by these 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 remedies 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.

§ 5.3.3 The Contractor shall be fully responsible for coordinating and expediting the work of all Subcontractors, and shall employ the necessary and qualified personnel to produce the required quality of labor and materials and to prevent delays in the progress of the Project. The Contractor shall afford each trade with all reasonable opportunities for the installation of its work and for the storage and handling of its materials. The Contractors shall include in the Contractor's bid, any work, in connection with the mechanical trades, to be done by other trades under the Contractor's direct control.

§ 5.3.4 Within thirty (30) calendar days after payment to Contractor by the Owner, the Contractor shall pay any amounts due any Subcontractor, whether for labor performed or materials furnished when such labor or material has been included in requisition submitted by such Contractor and paid by Owner. The Contractor shall promptly give notice to the Owner of any claim or demand by a Subcontractor claiming that any amount is due to such Subcontractor or claiming any default by the Contractor in any of the Contractor's obligations to such Subcontractor.

§ 5.3.5 The Contractor shall include in each of the subcontracts a provision requiring each Subcontractor to pay amounts due to any Sub-Subcontractors, whether for labor performed or materials furnished, within thirty (30) days after such Subcontractor receives a payment from the Contractor which encompasses labor or materials furnished by such Sub-subcontractor and a provision requiring each Subcontractor to promptly any claim or demand by a Sub-subcontractor claiming that any amount is due to such Sub-Subcontractor or claiming any default by such Subcontractor in any of its obligations to such Sub-subcontractor which notice the Contractor shall promptly relay to the Owner.

§ 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 but does not accept and shall not be liable for Contractor's obligations prior to the effective date of the assignment. The Contractor agrees to execute any and all other documents required to affect this assignment.

§ 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 direct costs resulting from the suspension, provided, however, that no such adjustment will be made to the compensation of a Subcontractor who is compensated as a proportion of the total project cost or a Subcontractor who is in default of its subcontract at the time of assignment.

§ 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.

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, to supplement the Contractor's forces and to award separate contracts in connection with other portions of the Project or other construction or operations on the site. If the Contractor claims that delay or is involved because of such action by the Owner, the Contractor shall make such Claim as is permitted in Articles 8 and 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 Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. 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 INTENTIONALLY OMITTED

§ 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. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 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. If such separate contractor sues or initiates an arbitration proceeding against the Owner on account of any damage alleged to have been caused by the Contractor, the Owner shall notify the Contractor, who shall defend such proceedings at the Contractor's expense, and if any judgment or award against the Owner arises therefrom, the Contractor shall pay or satisfy it and shall reimburse the Owner for all attorneys' fees and court or arbitration 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.

§ 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. The decision as to whether the Change Work is executed via a Change Order, Construction Change Directive, or a minor change in the Work is the decision of the Owner.

§ 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.

§ 7.1.4 Except as permitted in Paragraph 7.3, a change in the Contract Sum or the Contract Time shall be accomplished only by a written Change Order executed before the Work is performed. Accordingly, no course of

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conduct or dealings between the parties, nor express or implied acceptance of alterations or additions to the Work, and no claim that Owner has been unjustly enriched by any alteration of or addition to the Work, whether or not there is, in fact, any unjust enrichment to the Work, shall be the basis of any claim to an increase in any amounts due under the Contract Documents or a change in any time period provided for in the Contract Documents.

§ 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.

§ 7.2.2 Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the Work that is the subject of the Change Order, including, but not limited to, all direct and indirect costs associated with such change and any and all adjustments to the Contract Sum and the Contract Time.

§ 7.2.3 Proposed changes in the Work requested during the construction phase shall be priced by the Contractor and submitted to the Architect and Owner for review, in such form as the Architect and Owner may require, within ten (10) calendar days following the Contractor's receipt of the request. The Contractor shall promptly revise and resubmit such proposal if the Architect and Owner determine that it is not in compliance with the requirements of this Article, or that contains errors of fact or mathematical errors. If required by the Architect or Owner, in order to establish the exact cost of new Work added or previously required Work omitted, the Contractor shall obtain and furnish to the Architect and Owner bona fide proposals from recognized suppliers for furnishing and material included in such Work. Such proposals shall be furnished at the Contractor's expense.

§ 7.2.4 The Contractor's proposal for a change in the Work (Change Order Proposal) shall be itemized completely and shall include: Specific number of calendar days for additional time (if applicable); all material costs and quantities accompanied by the original manufacturer invoices; labor wages; unit prices; subcontractor costs; mark ups; equipment costs, profit, overhead, general conditions, fees, bond costs and approved daily time sheet tickets for work performed under the utilization of labor rates. The Architect's and Owner's refusal to approve a Change Order or Change Order Proposal due to the Contractor's lack of itemized backup information shall not be used to substantiate a claim for additional time.

§ 7.2.5 If the method utilized to execute the Change in the Work is based on labor rates, unit prices and material costs, then actual daily time sheets / tickets, approved by the Superintendent and the Owner, must accompany the Change Order, Construction Change Directive, or minor change in the Work. Not including the actual daily time sheets / tickets, approved by the Superintendent and the Owner, with the Change Order, Construction Change Directive, or minor change in the Work may be cause for their rejection.

§ 7.2.6 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both addition 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 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. The Owner may also by Construction Change Directive order work to be performed that has been interpreted by the Owner and Architect to be part of the Work but is disputed by the Contractor through submission of a Claim.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order or work interpreted by the Owner or Architect to be part of the Contract.

§ 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 and rates 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 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, and other employee costs approved by the Architect;
- .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, in writing, 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.

§ 7.3.7 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.

§ 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 necessary for the Contractor to proceed with the Work. 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.

§ 7.4 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. The Architect's order for minor changes shall be in writing. 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. . **TIME IS OF THE ESSENCE** of all Milestone Dates, the Substantial Completion date and the Final Completion date in the accepted Construction Schedule, as such Schedule may be revised and approved by the Owner.

§ 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.

§ 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 commence the Work prior to receiving written notice to commence from the Owner or prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.2.4 The Contractor shall proceed expeditiously in accordance with the construction schedule with adequate forces and shall achieve Substantial Completion within the Contract Time. The Contractor shall at all times ensure that each Subcontractor is providing and maintaining sufficient skilled workmen, materials and equipment to achieve Substantial Completion within the Contract Time. Absent Change Orders signed by the Owner or a delay for which the Contractor is entitled to an extension of time by § 8.3.1, the Contractor shall not make any claims for additional payment of straight time, overtime or premium time in undertaking to achieve Substantial Completion of the Work in accordance with the construction schedule. The burden of lost time and costs related to any Subcontractor's nonperformance shall not be charged to Owner.

§ 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 binding dispute resolution; 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. Nothing in this Section 8.3.1 shall absolve the Architect of liability for delays due to the negligence of the Architect or its employees or consultants, or failure to comply with the agreement between the Owner and the Architect or the Contract Documents by the Architect or by the Architect's employees or consultants. Under no circumstances shall Owner be responsible or liable for any delay damages, including any *Eichleay* or other type of extended overhead or lost profit claims or damages, idle equipment costs, lost productivity or labor inefficiency costs, acceleration damages, suspension damages, consequential damages,

incidental damages, or lost opportunity costs. Contractor acknowledges that it is aware of and considered this provision when submitting and pricing its Proposal and Contractor accepts the risk of delays.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15. Extensions of time shall be Contractor's sole remedy in the event of delays.

§ 8.3.3 Notwithstanding anything to the contrary in the Contract Documents, an extension of the Contract Time, to the extent permitted under Subparagraph 8.3.1, shall be the sole and exclusive remedy of the Contractor for any delay, hindrance, disruption, interference or obstruction to the Work (collectively referred to in this Subparagraph 8.3.3 as "Delays"). Except as provided in Section 6.2.6 of the Contract, in no event shall the Contractor be entitled to any compensation or recovery of any damages in connection with any Delay, including, without limitation, consequential damages, loss of efficiency or productivity costs, acceleration costs, lost opportunity costs, impact damages, extended overhead costs, or other similar remuneration.

§ 8.3.4 TIME IS OF THE ESSENCE in the completion of the Work by the Contractor.

§ 8.3.5 No extension of time, or increase in the Contract Sum, shall be granted because of seasonal variations in temperature, humidity or precipitation, which conditions, excepting force majeure, shall be wholly at the risk of the Contractor.

§ 8.3.6 The Contractor shall not be entitled to an adjustment of the Contract Time on account of delays: (i) that it could have avoided or mitigated using its best professional efforts; (ii) that do not impact the critical path; (iii) for which there is available float in the chain of activities affected by the delay; (iv) that were caused by or could have been reasonably anticipated by the Contractor or those for whom it is responsible; or (v) that could have been mitigated or avoided by the Contractor's timely notice to the Owner as required hereunder.

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.

§ 9.2 Schedule of Values

The Contractor shall submit a schedule of values to the Architect within thirty (30) days of the first of the Contract Award or Preconstruction Meeting, 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. The description of the Work shall be sufficiently broken down to indicate labor and material costs associated with each area of Work. Any breakdown that fails to include sufficient detail, is unbalanced, or exhibits "front-loading" of the value of the Work, will be rejected. The Schedule of Values shall be revised if later determined by the Owner or Architect to be inaccurate. 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.

§ 9.3 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 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.

§ 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.

§ 9.3.1.3 Each application for payment shall be accompanied by the following, all in form and substance satisfactory to the Owner: (i) a duly executed Contractor's partial lien waiver; (ii) duly executed partial lien waivers from all Subcontractors and, when reasonably required, from material suppliers and lower tier Subcontractors establishing payment or satisfaction of payment of all amounts requested by the Contractor on behalf of such entities or persons in any previous Application for Payment; and (iii) all information and materials required to comply with the requirements of the Contract Documents or reasonably requested by the Owner or the Architect.

§ 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.

§ 9.3.3 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 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.

§ 9.4 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 solely to the Owner, based on the Architect's evaluation of the Work as provided in the Contract Documents and/or 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; or (3) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum. Notwithstanding anything herein to the contrary, issuance of a Certificate for Payment by the Architect is a recommendation only; payment to the Contractor of amounts certified in a Certificate for Payment is subject to the Owner's approval.

§ 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

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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;
- .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; or
- .8 failure to comply with or adhere to the requirements of the Contract Documents.

§ 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. The Owner shall not be deemed to be in default by reason of withholding payment while any of the above grounds remain uncured, nor shall any interest accrue or be payable with respect to any payments so withheld.

§ 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.

§ 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 five (5) 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. Notwithstanding anything in this Subparagraph 9.6.2 to the contrary, the Owner may elect, in the Owner's reasonable discretion, to make any payment requested by the Contractor on behalf of a Subcontractor or material supplier of any tier jointly payable to the Contractor and such Subcontractor or material supplier, or directly payable to such Subcontractor or material supplier. The Contractor and such Subcontractor or material supplier shall be responsible for the allocation and disbursement of funds included as part of any such joint payment. In no event shall any joint payment be construed to create any (i) contract between the Owner and a subcontractor or material supplier of any tier, (ii) obligations from the Owner to such subcontractor or material supplier, or (iii) rights in such subcontractor or material supplier against the Owner. All such payments by the Owner shall be a pro tanto discharge of sums due the Contractor.

§ 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. The Owner may contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor

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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 or provide the Contractor with a written explanation for the reason for withholding such Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the properly submitted Application for Payment, or if the Owner does not pay the Contractor or provide the Contractor with a written explanation of the reason for withholding payment within seven days after the date established in the Contract Documents, the amount certified by the Architect or if the Owner does not so pay an amount 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 or an explanation of the reason for withholding such payments 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.

§ 9.8 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. As a condition precedent to Substantial Completion, the Contractor shall assemble and deliver to the Owner (1) all maintenance and operating manuals; (2) marked sets of field record drawings and specifications reflecting as-built conditions; (3) drawings reflecting the location of any concealed utilities, mechanical or electrical systems and components; (4) any special guaranties or warranties required by the Contract Documents; (5) all guaranties and warranties from Subcontractors, vendors, suppliers or manufacturers; (6) a list of the names, addresses and telephone numbers of all subcontractors and any other persons providing guaranties or warranties; (7) a permanent Certificate of Occupancy; (8) Operating permits for any mechanical equipment; and (9) any other permits, approvals, licenses, and other documents from any governmental authority having jurisdiction thereof necessary for the beneficial use and occupancy of the Project.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall notify the Architect and the Owner in writing and shall prepare and submit to the Architect (1) a comprehensive list of items to be completed or corrected prior to final payment and (2) all Certificates of Occupancy and applicable permits required by the Contract Documents, endorsed by the Contractor and in a form reasonably acceptable to the Architect and Owner. Promptly after receiving such notice, the Architect will conduct a preliminary review to determine whether or not the Documents are generally complete and correct. If the Architect finds on the basis of this review that the Contractor's notice and supporting documents are not generally complete or correct, the Architect will return them to the Contractor for revision and

resubmittal, describing in general the additions or corrections required. If the Architect finds on one preliminary review of the Contractor's resubmittal that the resubmitted notice and supporting documents are still not generally complete and correct, the Contractor shall again correct and resubmit them, and shall, in addition, reimburse the Owner for the cost of any change in the Architect's services resulting from such a second and any subsequent preliminary reviews. When the Architect finds on the basis of a preliminary review that the Contractor's notice and supporting documents are substantially complete, the Architect will proceed as stated in Section 9.8.3 below. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 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. Owner shall be entitled to retain two hundred percent (200%) of the estimated cost of incomplete or unsatisfactory Work to reach Final Completion.

§ 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.

§ 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, 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 substantial 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 and (5), statements in a form satisfactory to the Owner that in consideration of all prior payments and of final payment, the Contractor and its Subcontractors release and forever discharge the Owner from all mechanic's liens, claims, demands, obligations and liabilities of every kind arising out of or relating to the Contract or the Project other than those Claims specifically enumerated in the statement. 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. If such lien 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 such lien, including all costs and 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.

§ 9.10.4 INTENTIONALLY OMITTED
(Paragraphs Deleted)

§ 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.

§ 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 the Conditions and 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. Contractor acknowledges that public health, safety, and

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security are of the utmost importance in connection with its performance of the Work. Contractor shall, at all times, implement and maintain commercially reasonable safety, health, and security protocol with respect to its personnel on site, including implementing best practices as defined by the United States Centers for Disease Control and state and local public health agencies to avoid exposure to and protection against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) aka COVID-19. Contractor shall also take such actions as are necessary to protect the health, safety and security of the occupants and users of the subject property in connection with the Work and the Project, including adherence to guidelines promulgated by the State of Connecticut.

§ 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. The Contractor shall also be responsible, at the Contractor's sole cost and expense, for all measures necessary to protect any property adjacent to the Project and improvements thereon. Any damage to such property or improvements shall be promptly repaired by the Contractor at its sole cost and expense.

§ 10.2.3.1 When there are indications that the use of explosives or other hazardous material, equipment or unusual methods is necessary for execution of the Work, the Contractor shall give the Owner and Architect reasonable advance notice of the conditions.

§ 10.2.3.2 The Contractor shall be solely responsible for the handling, storage, and use of explosive or other hazardous materials when their use is permitted.

§ 10.2.3.3 The Contractor shall not bring explosives onto the site or use such in the Work without the prior written permission of the Architect and the Owner. For such use, the Contractor shall obtain necessary permits with copies to the Architect and the Owner. The Contractor shall furnish the Owner and Architect with certificates indicating proper and adequate insurance.

§ 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 to property referred to in subparagraphs 10.2.1.2, 10.2.1.3 and 10.2.1.4. If the damage or loss is due in whole or in part to the Contractor's failure to take the precautions required by this paragraph 10.2, the Contractor shall bear the cost. 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.

§ 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 The Contractor shall at all times provide protection against weather (snow, rain, wind, storms or heat) so as to maintain all Work, materials, apparatus and fixtures free from damage. At the end of the day's work, all new Work likely to be damaged shall be reasonably protected against such weather.

§ 10.2.9 The Contractor shall provide adequate fire protection for all operations associated with the Work, and such protection must meet all applicable federal (including OSHA), State and municipal regulations.

§ 10.2.10 **The Contractor shall remove and replace with new work at the Contractor's own expense, any Work damaged by failure to provide protection.**

§ 10.2.11 The Contractor shall be responsible, to the extent not covered by insurance, for damage, loss, or liability due to theft or vandalism to the Work and stored materials when work is not in progress at night, on weekends or holidays.

§ 10.2.12 No visitors shall be allowed on the work site without prior written permission from the Owner.

§ 10.2.13 Cutting and welding to be performed in or immediately adjacent to existing spaces shall not be performed without written approval of the Owner for each instance.

§ 10.2.14 All employees at the worksite shall have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work. The Contractor and all Subcontractors shall furnish documentation of successful completion of said course with the first certified payroll report for each employee. The Contractor shall indemnify and hold harmless the Owner from any and all fines, costs and expenses, including but not limited to reasonable attorney's fees, incurred by Owner due to the Contractor's violation of such Acts, standards and/or regulations. Such indemnity shall not be construed to limit the indemnity required under Subparagraph 3.18.1.

§ 10.2.15 The Contractor shall comply with the requirements of the Occupational Safety and Health Act and the Construction Safety Act of 1969, including all standards and regulations which have been promulgated by the governmental authorities which administer such Acts and said requirements, standards and regulations are incorporated herein by reference. The Contractor shall be directly responsible for compliance therewith on the part of its agents, employees, subcontractors, and material suppliers and shall directly receive and be responsible for all citations, assessments, fines, or penalties which may be incurred by reason of its agents, employees, material suppliers or subcontractors, to so comply.

§ 10.2.16 The Contractor shall at all times protect excavations, trenches, buildings, and materials from rainwater, ground water, ice, snow, back-up or leakage of sewers, drains, or other piping, and from water of any other origin and shall remove promptly any accumulation of water. The Contractor shall provide and operate all pumps, piping, and other equipment necessary to this end.

§ 10.2.17 MOLD GROWTH. The Contractor shall establish and maintain a program and safeguards to prevent growth of mold.

§ 10.2.18 Contractor and its Subcontractors shall not make news releases or publicize or issue advertising pertaining to the Work of this Agreement without first obtaining the written approval of the Owner.

§ 10.2.19 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.

§ 10.2.20 The Contractor shall promptly report in writing to the Owner and Architect all accidents arising out of or in connection with the Work that cause death, personal injury, or property damage, giving full details and statements of any witnesses. In addition, if death, serious personal injuries, or serious damages are caused, the accident shall be reported immediately by telephone or messenger to the Owner and the Architect.

§ 10.2.21 The Contractor shall provide and maintain in good operating condition suitable and adequate fire protection equipment and services and shall comply with all reasonable recommendations regarding fire protection made by the representatives of the fire insurance company carrying insurance on the Work or by the local fire chief or fire marshal. The area within the site limits shall be kept orderly and clean, and all combustible rubbish shall be promptly removed from the site.

§ 10.2.22 When all or a portion of the Work is suspended for any reason, the Contractor shall securely fasten down all coverings and protect the Work, as necessary, from injury by any cause.

§ 10.2.23 The Contractor shall at all times protect excavations, trenches, buildings and materials, from rainwater, ground water, backup or leakage of sewers, drains and other piping, and shall remove promptly any accumulation of water. The Contractor shall provide and operate all pumps, piping and other equipment necessary to this end.

§ 10.2.24 The Contractor shall remove snow and ice which might result in damage or delay to the Work.

§ 10.2.25 During the progress of the Work and at all times prior to the date of Substantial Completion or occupancy of the Work by the Owner, whichever is earlier, the Contractor shall provide temporary heat, ventilation, and enclosure, adequate to permit the Work to proceed in a timely fashion, and to prevent damage to completed Work or Work in progress, or to materials stored on the premises. The permanent heating and ventilation systems may be used for these purposes when available and appropriate, but the fuel cost shall be paid 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 the Contractor shall immediately report the condition to the Owner and the Architect in writing and take reasonable precautions 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). If such reasonable precautions will be inadequate to prevent foreseeable bodily injury and death, the Contractor shall 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. When the material or substance has been rendered harmless, any Work that has been stopped in the affected area shall resume. By Change Order, the Contract Time shall be extended appropriately. Termination of the Contract by the Owner due to the discovery of Hazardous Materials on the Project site shall be Termination for Cause. The term "rendered harmless" shall be interpreted to mean that levels of hazardous materials including, but not limited to asbestos and polychlorinated biphenyl, are less than any applicable exposure standards set forth in OSHA regulations. In no event, however, shall the Owner have any responsibility for any substance or material that is brought to the Project site by the Contractor, any Subcontractor or any materialman or supplier or any entity for whom any of them is responsible. The Contractor agrees not to use any fill or other materials to be incorporated into the Work which are hazardous, toxic or comprised of any items that are hazardous or toxic except to the extent provided in Section 10.3.7.

§ 10.3.3 The Contractor shall not be liable for pre-existing, environmental matters on, under or about the premises which constitute the Project, including without limitation, those relating to fines, orders, injunctions, penalties, damages, contribution, cost recovery compensation, losses or injuries resulting from the release or threatened release of hazardous materials, special wastes or other contaminants into the environment, the development or growth of mold within or on any structures, air quality levels, and to the generation, use, storage, transportation or illegal disposal of solid wastes, hazardous materials, special wastes or other contaminants. This disclaimer of liability shall apply to all such claims against the Contractor, whether direct or indirect, including without limitation, third party claims for which the Owner is seeking indemnification from the Contractor, excluding, however, any such claims that are caused by the negligence of the Contractor or subcontractor for which the Contractor is responsible.

§ 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 or intentional acts 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 properly performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.3.7 The Contractor will be solely responsible for compliance with laws and regulations governing the handling, storage, use or disposal of hazardous materials or wastes used, stored, generated, or disposed of in connection with construction of the Work, and shall obtain all permits and approvals, give all required notices, and observe all

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applicable procedures prescribed by the U.S. Environmental Protection Agency, the State of Connecticut and other governmental authorities having jurisdiction with respect to such activities. At Owner's request, Contractor shall furnish the Owner promptly with evidence satisfactory to Owner demonstrating the Contractor's compliance with such procedures, the giving of such notices, and the issuance of such permits and approvals, and shall indemnify Owner and hold Owner harmless with respect to any loss, damage or liability resulting from Contractor's failure to observe such procedures, give such notices, or obtain such permits and approvals. Contractor will be responsible for removal and disposal only of such "hazardous material" as is required to be removed by the Contract Documents or any such materials placed on the site by the Contractor or any party for which the Contractor is responsible.

§ 10.3.8 All material and equipment furnished under the Contract shall be free of asbestos and polychlorinated biphenyl (PCB). Any material or equipment containing these hazardous materials shall be considered defective and shall be removed by the Contractor at the Contractor's sole expense.

§ 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. The Contractor shall promptly notify insurers as applicable, the Architect and the Owner of the nature of the emergency. Immediately thereafter, the Contractor shall submit to the Architect and the Owner a written report including a description of circumstances of the emergency and details of action taken.

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 that are acceptable to the Owner and that are lawfully authorized to issue insurance in Connecticut. 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.

The insurance required shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and with respect to Contractor's completed operations coverages, as specified in the Contract Documents.

§ 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 that are acceptable to the Owner and that are lawfully authorized to issue surety bonds in Connecticut.

§ 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 three (3) 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.

§ 11.1.5 The limits specified in the Contract Documents are minimum requirements and shall not be construed in any way as limits of liability or as constituting acceptance by the Owner of responsibility for losses in excess of such limits. The Contractor shall be responsible for all deductibles applicable to any insurance. No acceptance and/or approval of any insurance by Owner shall be construed as relieving or excusing Contractor from any liability or obligation imposed by the provisions of the Contract Documents.

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§11.1.6 The Contractor shall not commence the Work under the Contract nor permit any Subcontractor to commence work on a subcontract until all the insurance required is obtained. The Contractor may carry, at its own expense, such additional coverage as it may deem necessary. The Contractor shall not be deemed to be relieved of any responsibility by the fact it carries insurance. Should the Contractor at any time neglect or refuse to provide the insurance required herein or should such insurance be cancelled or should the full annual aggregate or any policy not be available to satisfy the requirements of the Contract, the Owner shall have the right to procure such insurance and the cost thereof shall be deducted from monies then due or thereafter to become due the Contractor.

§ 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 Connecticut.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner does not intend 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 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 and Architect 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 in good faith 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 the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and 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 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, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly and at its own expense 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. This obligation shall survive termination of the Contract under Paragraph 14 of the General Conditions. Nothing in this Section 12.2.1 shall absolve the Architect of its liability for failure to fulfill its obligations under the agreement between the Owner and the Architect.

§ 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.

§ 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. Upon completion of any work under or pursuant to this Section 12.2, the one-year correction period in connection with the Work requiring correction shall be renewed and recommence.

§ 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.

§ 12.2.6 AUDITS

Upon request of the Owner or the Architect, the Contractor will cooperate, and secure the cooperation of all Subcontractors and Sub-subcontractors and assist the Owner and Architect during any audit of the Project conducted by the Owner at any time after Substantial Completion.

§ 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.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the State of Connecticut.

§ 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. The Contractor may not assign the Contract without the Owner's prior written consent, which consent the Owner may withhold in its absolute discretion. If the Contractor attempts to make an assignment without such consent, the Contractor shall nevertheless remain legally responsible for all of the Contractor's obligations under the Contract.

§ 13.2.2 Contractor shall execute all consents reasonably required to facilitate an assignment by the Owner.

§ 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 or in equity.

§ 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.

§ 13.3.3 No provision contained in the Contract Documents shall create or give to third parties any claim or right of action against the Owner or the Contractor except as specifically provided herein.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, certifications and approvals of portions of the Work shall be made as required by the Contract Documents and by the Conditions, 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 and 13.4.4, shall be at the Owner's expense.

§ 13.4.3 If inspections and tests conducted under this Section 13.4 reveal failure in a portion of the Work, the Owner may order the inspection and testing, at the Contractor's expense, of any and all portions of the Work that are identical or similar to the failing portion.

§ 13.4.4 Required certificates of testing, certification, 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.

§ 13.4.7 If any of the Work is required to be inspected or approved by any public authority, the Contractor shall cause such inspection or approval to be performed. No inspection performed or failed to be performed by the Owner hereunder shall be a waiver of any of the Contractor's obligations hereunder or be construed as an approval or acceptance of the work or any parts thereof.

§ 13.5 Interest

INTENTIONALLY OMITTED

§ 13.6 Wherever possible, each provision of this Agreement shall be interpreted in a manner as to be effective and valid under applicable law. If, however, any provision of this Agreement, or portion thereof, is prohibited by law or found invalid under any law, only such provision or portion therefore shall be ineffective, without in any manner invalidating or affecting the remaining provisions of this Agreement or valid portion of such provision, which are

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hereby deemed severable.

§ 13.7 The parties expressly understand and agree that any provision in this Contract related to job site safety, supervision, inspections or compliance with ordinances, laws, statutes, rules, regulations and/or protocols are solely for the benefit of the Contractor and Owner and do not create any rights, claims, or causes of action in third parties, separate contractors, Subcontractors or Sub-subcontractors, or any of their employees performing work on or at the Project. Nothing in this Agreement is intended to confer any rights in any other contractor, Subcontractor of any tier material supplier, or their employees, as there are no intended third party beneficiaries of this Agreement.

§ 13.8 Each and every provision of law and clause required by law to be inserted in this contract shall be deemed to be inserted herein and the contract shall be read and enforced as though it were included herein.

§ 13.9 If the Contractor is a "nonresident contractor" as defined in Section 12-430(7)(A) of the Connecticut General Statutes, as revised, the Contractor shall comply fully with the provisions of Section 12-430(7) and, prior to commencing the Work, shall furnish the Owner with a copy of the requisite certificate of compliance set forth in subparagraph (E) of Section 12-430(7). Contractor agrees to indemnify Owner as to any and all taxes, interest and penalties that the State of Connecticut asserts are due with respect to the Contractor's activities.

§ 13.10 Contractor shall comply with the requirements of Connecticut General Statutes Section 31-52. Specifically, Contractor agrees that in the employment of labor to perform the work specified herein, preference shall be given to citizens of the United States, who are, and continuously for at least three months prior to the date hereof have been, residents of the labor market area, as established by the Labor Commissioner, in which such work is to be done, and if no such qualified person is available, then to citizens who have continuously resided in the county in which the work is to be performed for at least three months prior to the date hereof, and then to citizens of the state who have continuously resided in the state at least three months prior to the date hereof.

§ 13.11 The wages paid on an hourly basis to any person performing the work of any mechanic, laborer or worker on the work herein contracted to be done and the amount of payment or contribution paid or payable on behalf of each such person to any employee welfare fund, as defined in Section 31-53 of the Connecticut General Statutes, shall be at a rate equal to the rate customary or prevailing for the same work in the same trade or occupation in the town in which such public works project is being constructed. Any contractor who is not obligated by agreement to make payment or contribution on behalf of such persons to any such employee welfare fund shall pay to each mechanic, laborer, or worker as part of such person's wages the amount of payment or contribution for such person's classification on each pay day.

§ 13.12 Contractor and each of its Subcontractors shall furnish proof that each employee performing the work of a mechanic, laborer or worker on the Project has completed a course of at least ten (10) hours in construction safety and health approved by the federal Occupational Safety and Health Administration (OSHA) or has completed a new miner training program approved by the Federal Mine Safety and Health Administration. Such proof shall be provided with the certified payroll submitted for the first week each such employee, mechanic, laborer, or worker, begins work on the Project.

§ 13.13 Contractor hereby confirms that it has complied with the obligations under the Immigration Reform and Control Act (IRCA) and that the workers provided under this Agreement are authorized for employment in the United States. Contractor further confirms that it has properly completed I-9's for all of its workers assigned to the Project and that it will require each of its Subcontractors to confirm that they have properly completed I-9's for all of their workers assigned to the Project. Contractor agrees to indemnify, defend, and hold harmless the Owner in the event that any of the workers assigned to the Project are found not to be authorized to work under the law or in the event that there is a determination that the obligations set forth under IRCA, including the obligation to correctly prepare and maintain I-9s, have not been complied with, including but not limited to all damages, fines and penalties, punitive damages, attorneys' fees and costs.

§ 13.14 Since the Contractor was required to be prequalified by the Connecticut Department of Administrative Services in the bidding for this Project, in the event the surety assumes the contract or obtains a bid or bids for completion of the contract, the surety shall ensure that the contractor chosen to complete the contract is prequalified pursuant to section 4a-100 of the Connecticut General Statutes in the requisite classification and has the aggregate work capacity rating and single project limit necessary to complete the contract.

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§ 13.15 Each payment application shall be accompanied by a statement showing the status of all pending Change Orders, pending Change Directives and approved changes to the Contract. Such statement shall identify the pending Change Orders and pending Change Directives, and shall include the date such Change Orders and Change Directives were initiated, additional cost and/or time associated with their performance and a description of any work completed. The Contractor shall require each of its Subcontractors and suppliers to include a similar statement with each of their payment applications or invoices.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped; or
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents and has not notified the Contractor of the reason for withholding payment.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon thirty (30) additional days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed. The notice of termination must state with specificity the means by which the Owner may cure its nonperformance, and the Contractor shall not terminate this Agreement if, within thirty (30) days of the notice, the Owner substantially undertakes such curative measures.

§ 14.1.4 INTENTIONALLY OMITTED

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may, without prejudice to any right or remedy available to the Owner under the Contract Documents or at law or in equity terminate the Contract if the Contractor:

- .1 institutes proceedings or consents to proceedings requesting relief or arrangement under the Federal Bankruptcy Act or any similar or applicable Federal or state law, or if a petition under any Federal or state bankruptcy or insolvency law is filed against the Contractor and such petition is not dismissed within sixty (60) days from the date of said filing, or if the Contractor admits in writing its inability to pay its debts generally as they become due, or if it makes a general assignment for the benefit of its creditors, or if a receiver, liquidator, trustee or assignee is appointed on account of bankruptcy or insolvency; or if a receiver of all or any substantial portion of the Contractor's properties is

appointed;

.2 abandons the Work; or if it fails, except in cases for

which extension of time prosecute promptly and diligently the Work;

- .3 fails to supply enough properly skilled workers or proper materials for the Work;
- .4 submits an Application for Payment, sworn statement, waiver of lien, affidavit or document of any nature whatsoever which is intentionally falsified;
- .5 fails to make payment to Subcontractors for materials or labor in accordance with the Contract Documents and the respective agreements between the Contractor and the Subcontractors;

- .6 disregards the Conditions, applicable laws, statutes, ordinances, codes; rules and regulations, or lawful orders of a public and appropriate authority;
- .7 otherwise commits a substantial breach of a provision of the Contract Documents or
- .8 if a mechanic's or materialmen's lien or notice of lien is filed against any part of the Work or the site of the Project and not promptly bonded or insured over by the Contractor after the receipt of notice thereof in a manner reasonably satisfactory to the Owner.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, 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 unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.2.5 If the Owner terminates the Contractor for cause and it is thereafter determined that the Owner did not have the right to terminate the Contractor for cause, such termination for cause shall automatically be converted into a termination for convenience under Article 14.4 hereto.

§ 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 direct costs and time caused by suspension, delay, or interruption under Section 14.3.1. 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 Upon such termination, the Contractor shall recover as its sole remedy payment for Work properly performed in connection with the terminated portion of the Work prior to the effective date of termination and for items properly and timely fabricated off the Project site, delivered and stored in accordance with the Owner's instructions. The Contractor hereby waives and forfeits all other claims for payment and damages, including,

without limitation, anticipated profits and consequential damages. In no event shall Contractor claim or be entitled to payment of overhead or profit on Work not performed. The Owner shall be credited for (i) payments previously made to the Contractor for the terminated portion of the Work, (ii) claims that the Owner has against the Contractor under the Contract, and (iii) the value of the materials, supplies, equipment, or other items that are to be disposed of by the Contractor that are part of the Contract Sum.

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.

Failure to give such timely written notice will bar any claims by the Contractor. The Owner's prior written consent to proceed with any Work for which the Contractor will claim it is entitled to additional compensation is a condition precedent to recovery for such work. Any notice of Claim must clearly identify the alleged cause and the nature of the Claim and include date and information then available to the claimant that will facilitate prompt verification and evaluation of the Claim.

§ 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.

§ 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. Failure by the Contractor to give such notice within the time specified shall greatly prejudice the Owner, and the failure to submit proper and timely notice shall constitute a waiver and abandonment of such 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 in accordance with the Contract Documents. The Owner shall have no obligation to make payments to the Contractor on or against such claims, disputes, or other matters in question during the pendency of any mediation, arbitration, or other proceedings to resolve such matters. Owner shall continue to make payments of undisputed amounts.

§ 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, 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.

§ 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, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. The Contractor shall have the burden of demonstrating the effect of the claimed delay on the Contract Time, and shall furnish the Owner and the Architect with such documentation relating thereto as the Owner and the Architect may reasonably require. In the case of a continuing delay, only one Claim is necessary. Any request seeking an extension of time contain:

- .1 a detailed description of the nature of each cause of delay, the date or dates upon which each cause of delay began and ended (as known or as projected), the number of days of delay attributable to each such cause, and the impact of such delay upon the construction schedule;
- .2 the construction schedule in effect at the start of the delay, showing that the portion of the Work that was, or will be, delayed is on the critical path and that no float remains or will be available for the delayed activities at the start of the delay;
- .3 a schedule analysis of the impact of the delay on the critical path in the construction schedule at the time of the delay, including any proposed adjustment to the Contract Time; and
- .4 such other supporting data that the Owner may request.

§ 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

INTENTIONALLY OMITTED

§ 15.1.6 LIQUIDATED DAMAGES

It is mutually agreed that if the Contractor fails to reach Substantial Completion of the Work by ten (10) months from the Owner's Notice to

Proceed, the Owner will be damaged; and because the amount of the Owner's damages is difficult if not impossible to definitely ascertain and prove, it is hereby agreed that the amount of such damages shall be One Thousand Five Hundred Dollars (\$1,500) for each Day, or part thereof, of delay in substantially completing the Work. The Contractor agrees that said sum shall be deducted from monies due the Contractor under the

Contract, or, if no money is due the Contractor, the Contractor hereby agrees to pay the Owner as liquidated damages, and not by way of penalty, such total sum as shall be due for such delay.

§ 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 decision shall be required as a condition precedent to mediation of any Claim. 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 demand or file for mediation of a Claim.

§ 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.

(Paragraph Deleted)

§ 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 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 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 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.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 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 claims, disputes and other matters in question between the Owner and the Contractor arising out of or related to the Contract or the breach thereof, except for claims which have been waived by the making and acceptance of final payments, shall be decided, at the sole option of the Owner, by one of the following dispute resolution procedures: (1) arbitration in accordance with rules agreed to by the Owner and the Contractor, (2) arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association then obtaining, or (3) litigation.

§ 15.4.1.1 INTENTIONALLY OMITTED

§ 15.4.2 If a demand for arbitration is filed by the Contractor, the Owner will advise the Contractor within thirty days after the receipt of such a demand for arbitration if the Owner elects to arbitrate or rejects arbitration; such election, once made, shall be binding. The filing of a demand for arbitration by the Owner shall be deemed an election to arbitrate and shall constitute the exercise of the option of the Owner to proceed with arbitration. The Owner, but not the Contractor, may join or consolidate with any arbitration with the Contractor any disputes with the Architect, any Subcontractor, or any other party having an interest in the proceeding. This agreement to arbitrate shall be specifically enforceable under applicable law in any court having jurisdiction thereof. The award rendered by the arbitrator or arbitrators shall be final and judgment may be entered upon it in accordance with the applicable law in any court having jurisdiction thereof

§ 15.4.3 The Contractor agrees to continue performance of the Contract Work and shall proceed in accordance with the directives of the Owner, under protest, in *(Paragraph Deleted)*

the event of a dispute or controversy. Failure to so proceed shall constitute a material breach of the Contract, regardless of the ultimate decision on the dispute, it being understood and agreed that any controversy between the parties shall not be deemed a basis to delay or suspend the Contract Work, unless directed otherwise by the Owner.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 INTENTIONALLY OMITTED

§ 15.4.4.2 INTENTIONALLY OMITTED

§ 15.4.4.3. INTENTIONALLY OMITTED

GENERAL CONDITIONS

The Work of this Contract shall be subject to the American Institute of Architects Document A201, "General Conditions of the Contract for Construction", herein referred to as the General Conditions.

SUPPLEMENTARY CONDITIONS

The supplementary Conditions contain changes and additions to the General Conditions. Where any part of the General Conditions is modified or voided by the Supplementary Conditions, the remaining unaltered provisions shall remain in effect.

ARTICLE 1 Make the following changes:

1.1.3.1 **Add the following:** Asbestos material encountered in the existing structure of the Project, and its treatment or removal is a part of the Work. The disposition of such material will be the responsibility of the Contractor. The Contractor shall be required to take appropriate precautions for Workers performing tasks in asbestos environments, ie. Basements, pipe tunnels, etc.

1.2.3 **Add the following:** When applied to materials and equipment required for the Work, the words "furnish", "install" and "provide" shall mean the following:

- .1 The word "provide" shall mean to furnish, pay for, deliver, install, adjust, clean, and otherwise make materials and equipment fit and ready for their intended use.
- .2 The word "furnish" shall mean to secure, pay for, deliver to site, unload, and uncrate materials and equipment.
- .3 The word "install" shall mean to place in position, incorporate in the work, adjust, clean, make fit and ready for use and perform all services except those included under the term "furnish".
- .4 The phrase "furnish and install" shall be equivalent to the word "provide". Each shall be interpreted to mean "the Contractor shall furnish all labor, material and equipment and install...".
- .5 "As required" shall mean as required to produce a fully completed project or result to the satisfaction of the Architect.
- .6 Instructions or specifications of a particular manufacturer as referred to herein shall be binding as a part of this Specification. Obtain such written instructions and maintain on the job with the Specification.
- .7 Schedules of materials in various sections of the Specifications are furnished to assist the Contractor. Contractor shall verify the schedules with the Drawings and shall provide any additional materials indicated on the Drawings but not included in the schedules. The greater quantity or highest quality will govern.

Add the following:

1.2.4 All work shown or referred to in the Contract Documents shall be included in the Contract excepting those items which are specifically noted as being "provided under another contract" or "provided by the Owner", or "not in contract (NIC)".

1.2.5 Parties to the Contract shall not take advantage of obvious error or apparent discrepancy in Contract Documents. Notice of discovered error or discrepancy shall immediately be

given in writing to the Architect to make such corrections and interpretations as he may deem necessary for completion of the work in a satisfactory and acceptable manner.

ARTICLE 2 Make the following changes:

- 2.3.6 **Revise to read as follows:** “Contractor shall be furnished up to three (3) sets of Contract Drawings and Specifications, and two (2) copies of each drawing which is issued after the date of the Contract. The Contractor shall pay costs of reproduction for any additional copies of Drawings or Specifications he requires.”

ARTICLE 3 Make the following changes:

- 3.4.3 **Amend to include the following:** All workers shall be properly attired at all times on the job site including shirt, shorts or pants in good condition and without any political or off-color messages consistent with school policies.

Add the following:

- 3.5.1.1 Project Warranty: Unless otherwise specified, Contractor shall warrant (guaranty) all work against defects resulting from the use of material, workmanship or equipment which is inferior, defective, or not in accordance with the terms of the Contract. This warranty, unless stated otherwise in a given section of the Specifications, shall be for a period of one (1) year from the date of issuance of the Certificate of Substantial Completion for the Project.
- .2 Specified Product Warranty: Issued by a manufacturer or fabricator for compliance with requirements of the Contract Documents. Refer to sections of Specifications for requirements of specified warranties.
- .3 Coincidental Product Warranty: Available on a product incorporated into the work, by virtue of manufacturer's publication of warranty without regard for application requirement, a non-specified warranty. Contractor shall identify such warranties as they apply.
- .4 Warranty Obligations
- .1 Contractor shall restore or remove-and-replace warranted work to its originally specified condition, at such time during warranty as it does not comply with or fulfill terms of warranty.
- .2 Contractor shall restore or remove-and-replace other work which has been damaged by failure of warranted work, or which must be removed and replaced to gain access to warranted work.
- .3 Cost of restoration or removal-and-replacement is Contractor's obligation, without regard to whether Owner has already benefited from use of failing work.
- .4 Except as otherwise indicated or required by governing regulations, warranties do not cover consequential damage to property other than the Work of the Contract.
- .5 Upon restoration or removal-and-replacement of warranted work which has failed, Contractor shall reinstate the warranty by issuing newly executed form, for at least the remaining period of time of the original warranty, but for not less than half of the original warranty period.

- .6 Warranties and warranty periods shall not diminish implied warranties, and shall not deprive Owner of actions, rights, and remedies otherwise available if the Contractor fails to fulfill the requirements of the Contract Documents.
- .7 Owner reserves the right to reject coincidental product warranties which conflict with or are less than the requirements of the Contract Documents.

.5 Contractor shall furnish fully executed warranties to Owner in accordance with the General Conditions and Section 017700.

3.7.7 The Town will forgive or not charge any fees for permits issued by it or its agents except for fees required to be collected and remitted to the State or Federal Government. Contractor will include and pay all utility permits and charges as well as any permit fees charged by any other governmental agency.

3.10.1 **Replace in the first sentence** “information” to read “approval”.

3.11 **Amend to include the following:** Contractor shall mark up the record drawings with “record information” in a legible manner to show: (i) deviations from the Drawings made during construction; (ii) details in the Work not previously shown; (iii) changes to existing conditions or existing conditions found to differ from those shown on any existing drawings; (iv) the actual installed position of equipment, piping, conduits, electric fixtures, circuiting ducts, dampers, access panels, control valves, drains, openings, and stub-outs; and (v) such other information as either Owner or Architect may reasonably request. Contractor shall deliver all Record Drawings to Owner as a condition precedent to Substantial Completion of the Work.

Add the following:

3.15.3 The Contractor shall provide all project cleaning and removal of materials, along with protection of the work and existing conditions. In the event of a dispute between the Owner and the Contractor concerning rubbish and orderliness on the site, the Owner may have the rubbish removed and charge the cost to the Contractor. Upon written notification from the Architect that the project requires cleaning, the Contractor shall within 24 hours remove all rubbish and hazards from the project and shall arrange his material and equipment in an orderly manner on the site. If this cleaning is not completed within 24 hours, the Owner may engage labor to clean up the projects to his satisfaction and deduct the costs from any monies due the Contractor.

3.19.1 The Contractor shall arrange for and attend job meetings with the Architect and such other persons as the Architect may from time to time wish to have present. The Contractor shall be represented by a principal, project manager, general superintendent, or other authorized main office representative, as well as by the Contractor’s own superintendent. An authorized representative of any Subcontractor or Sub-subcontractor shall attend such meetings if the representative’s presence is requested by the Architect. Such representatives shall be empowered to make binding commitments on all matters to be discussed at such meetings, including costs, payments, change orders, time schedules and manpower. Any notices required under the Contract may be served on such representatives.

ARTICLE 4 Add the following:

- 4.3 The provisions of Article 15 notwithstanding, the Contractor expressly agrees to joinder in arbitration proceedings between Owner/Architect upon specific written request of the Owner. This agreement shall be valid with the Architect's acceptance of an equal provision in their respective contracts.

ARTICLE 7 Add the following:

- 7.1.5 Any request by the Contractor for an increase in the Contract Sum or Contract Time under this Article 7 must be submitted in writing to both the Owner and the Architect within twenty-one (21) days of the discovery of the event giving rise to the request and shall be accompanied by documentation substantiating the requested increase in the Contract Sum or Contract Time. Any such request shall be itemized completely and in detail and shall include, at a minimum, material costs and quantities, labor wages, time, insurance, pensions and equipment rental other than small tools, the number of additional calendar days, if any, which are required to complete the Work. Where unit prices have been established, any such request shall also state the quantity of materials involved and the applicable unit price.
- 7.1.6 Contractor expressly understands and agrees that, in any arbitration or litigation arising out of this Contract, it hereby waives the right to recover damages for any items that were not made the subject of a written request for an increase in the Contract Sum or Contract Time pursuant to this Article 7.
- 7.2.3 The Contractor's proposal for changes in the Work shall be itemized completely and in detail and shall include material costs and quantities, labor wages, time, insurance, pensions and equipment rental other than small tools, and the number of additional calendar days, if any, which are required to complete the Work.

Where unit prices have been established, the proposal shall state the quantity involved and the applicable unit price.

7.5 ALLOWANCE FOR OVERHEAD AND PROFIT

- 7.5.1 The allowance for overhead and profit is compensation for administration, superintendence, materials for temporary structures, additional premiums on bonds and the use of small tools.
- 7.5.2 For additions, deletions or other changes in the Work ordered under method 7.3.3.3, the Contractor may apply an allowance of up to fifteen percent (15%) for profit and overhead to the net cost of the work actually performed by him.
- 7.5.3 Work to be performed by a subcontractor may include an allowance for the subcontractor's overhead and profit not to exceed fifteen percent (15%) of the net cost. The Contractor is permitted up to a **ten percent (10%)** allowance to be applied against the net cost to a subcontractor. In no case shall the total allowance exceed twenty-five percent (25%) of the net cost of work performed by the subcontractor.

- 7.5.4 The Contractor's allowance of up to ten percent (10%) on changes involving more than one (1) subcontractor shall be applied only to the combined net of cost additions and deductions of all subcontractors.
- 7.5.5 There shall be no allowance for overhead and profit for the Contractor or any subcontractor on changes resulting in a net deduction.
- 7.5.6 The provisions of this Article shall apply only to subcontractors as defined in Article 5. Allowance for overhead and profit will be accepted only for those who are direct subcontractors.

ARTICLE 8 Add the following:

- 8.3.3.1 By way of illustration and not limitation, in addition to the foregoing and to all other express provisions in the Contract Documents, the following are types of delay which could occur and are contemplated by the parties.
- .1 delay caused by change orders;
 - .2 delays caused by the bankruptcy or insolvency of one (1) or more Subcontractors, material suppliers or other contractors;
 - .3 delays caused by changes necessitated by changes in laws or regulations;
 - .4 unavailability or shortage of building materials;
 - .5 job site theft;
 - .6 weather conditions;
 - .7 failure of one or more Subcontractors, material suppliers or other contractors to perform;
 - .8 vandalism or natural disaster requiring reconstruction;
 - .9 dispute resolution delays;
 - .10 design delays;
 - .11 delays related to hazardous substances.
- 8.3.4 No extension of time will be allowed for adverse weather conditions unless the number of days of inclement weather is substantially greater or conditions substantially more severe than the average for the calendar period as recorded by a recognized weather observation agency.

ARTICLE 9 Make the following changes:

- 9.3.1 **Revise** “ten days” to read “five (5) days”.

Add the following:

- 9.3.1.3.1 Contractor shall furnish with Application for Payment an invoice establishing value of material and equipment stored at the site along with a statement of amount to be paid the vendor.
- .1 Such stored items are subject to inspection by Architect before payment is recommended.

- .2 Contractor shall furnish Owner with Certificate of Insurance in accordance with Contract Documents for the full value of the items stored at the site.

9.3.1.4 During progress of the Work, the Owner will pay Contractor ninety-five percent (95%) of the total amount of each monthly payment due. The remaining five percent (5%) will be retained by the Owner until the Project is substantially completed. There will be no further reduction considered until final acceptance of the Project in accordance with the Contract Documents.

9.3.2 **Amend to include the following:** If the Contractor does not submit evidence of payment to vendor for material and equipment stored, the Architect will recommend deduction of the amount previously allowed for the items stored from the current or subsequent Application for Payment.

Add the following:

9.3.2.1 Contractor may include in Application for Payment the delivered cost of equipment and non-perishable materials delivered and stored at the site but not incorporated in the work, under the following conditions:

- .1 Items to be protected from fire, theft, vandalism, weather, and other damage.
- .2 Storage procedures and areas to be approved.
- .3 Items to be available at all times for inspection by the Owner and Architect.

9.6.2.1 Contractor shall furnish Architect with satisfactory evidence of payment to vendors supplying material and equipment for approved storage. Satisfactory evidence of payment shall be one (1) of the following:

- .1 Contractor's canceled check in correct amount with identification of invoices paid.
- .2 A letter or telegram from vendor with authorized signature stating amounts and invoices paid.
- .3 A receipted invoice.

9.6.7.1 Payment for material and equipment delivered and stored shall not relieve Contractor of responsibility for furnishing equipment and material required for the work in the same manner as if such payment were not made.

9.8.1 **Amend to include the following at the end of the first sentence:** and any work remaining can be completed within thirty (30) days and will not materially interfere with use and occupancy.

Add the following:

9.10.6 A prerequisite to final payment shall be that the Contractor furnish proof that he has completed all specification requirements covering the following item as applicable:

Warranties.

ARTICLE 10 **Make the following changes:**

10.2.12 **Revise** “21 days” to read “seven (7) days”.

ARTICLE 11 **Add the following:**

11.6 MISCELLANEOUS INSURANCE REQUIREMENTS

11.6.1 The Contractor shall not begin work until he has obtained all insurance as required, nor shall any subcontractor be permitted to commence work until he has obtained all insurance as required under the same provisions. Insurance shall be maintained throughout the life of the Contract.

11.6.2 It shall be the responsibility of the Contractor to obtain Certificates of Insurance from each subcontractor and to make certain that all coverage is maintained throughout the life of the Contract.

11.6.3 The Contractor, before commencing work, shall supply Owner with Certificates of Insurance evidencing compliance with the insurance requirements. Each certificate shall state that the insurance evidenced by such certificate will not be canceled or reduced without thirty (30) days prior written notice to the Owner.

11.6.4 Each subcontractor, before commencing work, shall supply Owner with Certificates of Insurance evidencing compliance with the insurance requirements. Each certificate shall state that the insurance evidenced by such certificate will not be canceled or reduced without thirty (30) days prior written notice to the Owner.

11.6.5 The Contractor shall maintain a file of Certificates of Insurance received from each subcontractor and provide Owner with copy of each certificate.

11.6.6 The Contractor shall furnish to the Owner copies of any endorsements subsequently issued amending coverage or limits.

11.6.7 The Contractor shall require each Subcontractor to procure insurance reasonably satisfactory to the Owner and name the Owner as additional insured under the Subcontractor’s comprehensive general liability policy.

11.6.8 Insurance requirements shall be provided as required in Bid Proposal Package.

ARTICLE 15 **Make the following changes:**

15.1.2 **Amend to include the following:** Failure to give such timely written notice will bar any claims by the Contractor. The Owner’s prior written consent to proceed with any Work for which the Contractor will claim it is entitled to additional compensation is a condition precedent to recovery for such work. Claims may also be reserved in writing within the time limits set forth in this Subparagraph 15.1.2. If a Claim is reserved, the Resolution of Claims and Disputes procedures described in Paragraph 15.2 shall not commence until a written notice from the claimant is received by the Architect. Any notice of Claim or reservation of Claim must clearly identify the alleged cause and the nature of the Claim

and include date and information then available to the claimant that will facilitate prompt verification and evaluation of the Claim.

Add the following:

15.3.1.2 The provisions of Article 15 notwithstanding, the Contractor expressly agrees to joinder in mediation proceedings between Owner/Architect upon specific written request of the Owner. This agreement shall be valid with the Architect's acceptance of an equal provision in their respective contracts.

Add the following Articles:

ARTICLE 16 ADDITIONAL PROVISIONS

16.1 Watchman

The employment of continuous watchman service to guard the property during any and all hours shall be at the discretion of the Contractor. However, the Contractor shall remove and restore all work or temporary structures damaged by fire, vandalism, or similar acts at no extra cost to the Owner.

16.2 Overtime

The Contractor must include within their base price all overtime, nights, holidays, and weekends as required to meet the Project Completion date.

END OF SECTION

Application and Certificate for Payment

TO OWNER: PROJECT: _____

FROM CONTRACTOR: VIA ARCHITECT: _____

APPLICATION NO: _____

PERIOD TO: _____

CONTRACT FOR: _____

CONTRACT DATE: _____

PROJECT NOS: _____ / _____ / _____

Distribution to:
 OWNER: ARCHITECT:
 CONTRACTOR: FIELD:
 OTHER:

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract. AIA Document G703®, Continuation Sheet, is attached.

1. ORIGINAL CONTRACT SUM \$0.00
2. NET CHANGE BY CHANGE ORDERS \$0.00
3. CONTRACT SUM TO DATE (Line 1 ± 2) \$0.00
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703) \$0.00
5. RETAINAGE:
 - a. 0 _____ % of Completed Work (Column D + E on G703) \$0.00
 - b. 0 _____ % of Stored Material (Column F on G703) \$0.00
- Total Retainage (Lines 5a + 5b or Total in Column I of G703) \$0.00
6. TOTAL EARNED LESS RETAINAGE \$0.00
(Line 4 Less Line 5 Total)
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT \$0.00
(Line 6 from prior Certificate)
8. CURRENT PAYMENT DUE \$0.00
9. BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 less Line 6) \$0.00

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR: _____ Date: _____

By: _____

State of: _____

County of: _____

Subscribed and sworn to before me this _____ day of _____

Notary Public: _____

My Commission expires: _____

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED \$0.00
(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	\$0.00	\$0.00
Total approved this Month	\$0.00	\$0.00
TOTALS	\$0.00	\$0.00
NET CHANGES by Change Order		\$0.00

CONNECTICUT DEPARTMENT OF LABOR
WAGE AND WORKPLACE STANDARDS DIVISION

CONTRACTORS WAGE CERTIFICATION FORM
Construction Manager at Risk/General Contractor/Prime Contractor

I, _____ of _____
Officer, Owner, Authorized Rep. Company Name

do hereby certify that the _____
Company Name

Street

City

and all of its subcontractors will pay all workers on the

Project Name and Number

Street and City

the wages as listed in the schedule of prevailing rates required for such project (a copy of which is attached hereto).

Signed

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

Notary Public

Return to:

Connecticut Department of Labor
Wage & Workplace Standards Division
200 Folly Brook Blvd.
Wethersfield, CT 06109

Rate Schedule Issued (Date): _____

**Minimum Rates and Classifications
for Building Construction**

ID#: 22-41090

**Connecticut Department of Labor
Wage and Workplace Standards Division**

By virtue of the authority vested in the Labor Commissioner under provisions of Section 31-53 of the General Statutes of Connecticut, as amended, the following are declared to be the prevailing rates and welfare payments and will apply only where the contract is advertised for bid within 20 days of the date on which the rates are established. Any contractor or subcontractor not obligated by agreement to pay to the welfare and pension fund shall pay this amount to each employee as part of his/her hourly wages.

Project Number: _____ Project Town: Cheshire
 State#: _____ FAP#: _____
 Project: Doolittle Elementary School Toilet Room Upgrades

CLASSIFICATION	Hourly Rate	Benefits
1b) Asbestos/Toxic Waste Removal Laborers: Asbestos removal and encapsulation (except its removal from mechanical systems which are not to be scrapped), toxic waste removers, blasters.**See Laborers Group 7**		
1c) Asbestos Worker/Heat and Frost Insulator	44.57	31.79
2) Boilermaker	44.46	28.51
3a) Bricklayer, Cement Mason, Concrete Finisher (including caulking), Stone Masons	37.75	34.62 + a
3b) Tile Setter	37.1	30.52
3c) Tile and Stone Finishers	30.0	25.30
3d) Marble & Terrazzo Finishers	31.07	24.23
3e) Plasterer	41.9	28.75

-----LABORERS-----

As of: October 28, 2022

4) Group 1: Laborers (common or general), acetylene burners, concrete specialists, wrecking laborers, fire watchers.	32.0	24.40
4a) Group 2: Mortar mixers, plaster tender, power buggy operators, powdermen, fireproofers/mixer/nozzleman (Person running mixer and spraying fireproof only).	32.25	24.40
4b) Group 3: Jackhammer operators/pavement breaker, mason tender (brick), mason tender (cement/concrete), forklift operators and forklift operators (masonry).	32.5	24.40
4c) **Group 4: Pipelayers (Installation of water, storm drainage or sewage lines outside of the building line with P6, P7 license) (the pipelayer rate shall apply only to one or two employees of the total crew who primary task is to actually perform the mating of pipe sections) P6 and P7 rate is \$26.80.	33.0	24.40
4d) Group 5: Air track operator, sand blaster and hydraulic drills.	32.75	24.40
4e) Group 6: Blasters, nuclear and toxic waste removal.	35.0	24.40
4f) Group 7: Asbestos/lead removal and encapsulation (except it's removal from mechanical systems which are not to be scrapped).	33.0	24.40
4g) Group 8: Bottom men on open air caisson, cylindrical work and boring crew.	30.28	24.40
4h) Group 9: Top men on open air caisson, cylindrical work and boring crew.	29.74	24.40
4i) Group 10: Traffic Control Signalman	18.0	24.40
5) Carpenter, Acoustical Ceiling Installation, Soft Floor/Carpet Laying, Metal Stud Installation, Form Work and Scaffold Building, Drywall Hanging, Modular-Furniture Systems Installers, Lathers, Piledrivers, Resilient Floor Layers.	36.07	26.15

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5a) Millwrights	36.32	26.81
6) Electrical Worker (including low voltage wiring) (Trade License required: E1,2 L-5,6 C-5,6 T-1,2 L-1,2 V-1,2,7,8,9)	40.6	32.21+3% of gross wage
7a) Elevator Mechanic (Trade License required: R-1,2,5,6)	58.9	36.885+a+b
-----LINE CONSTRUCTION-----		
Groundman	26.5	6.5% + 9.00
Linemen/Cable Splicer	48.19	6.5% + 22.00
8) Glazier (Trade License required: FG-1,2)	40.78	23.40 + a
9) Ironworker, Ornamental, Reinforcing, Structural, and Precast Concrete Erection	39.7	38.77 + a
----OPERATORS----		
Group 1: Crane Handling or Erecting Structural Steel or Stone; Hoisting Engineer (2 drums or over). (Trade License Required)	50.27	26.80 + a
Group 1a: Front End Loader (7 cubic yards or over); Work Boat 26 ft. and Over	46.07	26.80 + a
Group 2: Cranes (100 ton rate capacity and over); Bauer Drill/Caisson. (Trade License Required)	49.91	26.80 + a
Group 2a: Cranes (under 100 ton rated capacity).	49.06	26.80 + a
Group 2b: Excavator over 2 cubic yards; Pile Driver (\$3.00 premium when operator controls hammer)	45.71	26.80 + a

As of: October 28, 2022

Group 3: Excavator; Gradall; Master Mechanic; Hoisting Engineer (all types of equipment where a drum and cable are used to hoist or drag material regardless of motive power of operation), Rubber Tire Excavator (Drott-1085 or similar); Grader Operator; Bulldozer Finegrade. (slopes, shaping, laser or GPS, etc.). (Trade License Required)	44.86	26.80 + a
Group 4: Trenching Machines; Lighter Derrick; CMI Machine or Similar; Koehring Loader (Skooper); Goldhofer.	44.42	26.80 + a
Group 5: Specialty Railroad Equipment; Asphalt Spreader, Asphalt Reclaiming Machine; Line Grinder; Concrete Pumps; Drills with Self Contained Power Units; Boring Machine; Post Hole Digger; Auger; Pounder; Well Digger; Milling Machine (over 24 mandrel).	43.73	26.80 + a
Group 5 continued: Side Boom; Combination Hoe and Loader; Directional Driller.	43.73	26.80 + a
Group 6: Front End Loader (3 up to 7 cubic yards); Bulldozer (rough grade dozer).	43.38	26.80 + a
Group 7: Asphalt Roller; Concrete Saws and Cutters (ride on types); Vermeer Concrete Cutter; Stump Grinder; Scraper; Snooper; Skidder; Milling Machine (24" and under mandrel).	42.99	26.80 + a
Group 8: Mechanic; Grease Truck Operator; Hydroblaster; Barrier Mover; Power Stone Spreader; Welding; Work Boat Under 26 ft.; Transfer Machine; Rigger Foreman.	42.54	26.80 + a
Group 9: Front End Loader (under 3 cubic yards); Skid Steer Loader regardless of attachments; (Bobcat or Similar); Forklift, Power Chipper; Landscape Equipment (including Hydroseeder); Vacuum Excavation Truck and Hydrovac Excavation Truck (27 HG pressure or greater).	42.04	26.80 + a
Group 10: Vibratory hammer; ice machine; diesel and air, hammer, etc.	39.7	26.80 + a
Group 11: Conveyor, earth roller, power pavement breaker (whiphammer), robot demolition equipment.	39.7	26.80 + a

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Group 12: Wellpoint Operator.	39.63	26.80 + a
Group 13: Compressor Battery Operator.	38.97	26.80 + a
Group 14: Elevator Operator; Tow Motor Operator (solid tire no rough terrain).	37.66	26.80 + a
Group 15: Generator Operator; Compressor Operator; Pump Operator; Welding Machine Operator; Heater Operator.	37.2	26.80 + a
Group 16: Maintenance Engineer.	36.46	26.80 + a
Group 17: Portable Asphalt Plant Operator; Portable Crusher Plant Operator; Portable Concrete Plant Operator; Portable Grout Plant Operator; Portable Water Filtration Plant Operator.	41.39	26.80 + a
Group 18: Power Safety Boat; Vacuum Truck; Zim Mixer; Sweeper; (Minimum for any job requiring a CDL license); Rigger; Signalman.	38.61	26.80 + a
-----PAINTERS (Including Drywall Finishing)-----		
10a) Brush and Roller	37.22	23.40
10b) Taping Only/Drywall Finishing	37.97	23.40
10c) Paperhanger and Red Label	37.72	23.40
10e) Blast and Spray	40.22	23.40
11) Plumber (excluding HVAC pipe installation) (Trade License required: P-1,2,6,7,8,9 J-1,2,3,4 SP-1,2)	47.03	34.05
12) Well Digger, Pile Testing Machine	37.26	24.05 + a

As of: October 28, 2022

13) Roofer (composition)	40.1	23.40
14) Roofer (slate & tile)	40.6	23.40
15) Sheetmetal Worker (Trade License required for HVAC and Ductwork: SM-1,SM-2,SM-3,SM-4,SM-5,SM-6)	40.89	41.72
16) Pipefitter (Including HVAC work) (Trade License required: S-1,2,3,4,5,6,7,8 B-1,2,3,4 D-1,2,3,4, G-1, G-2, G-8 & G-9)	47.03	34.05
-----TRUCK DRIVERS-----		
17a) 2 Axle, Helpers	31.16	28.78 + a
17b) 3 Axle, 2 Axle Ready Mix	31.27	28.78 + a
17c) 3 Axle Ready Mix	31.33	28.78 + a
17d) 4 Axle	31.39	28.78 + a
17e) 4 Axle Ready Mix	31.44	28.78 + a
17f) Heavy Duty Trailer (40 Tons and Over)	33.66	28.78 + a
17g) Specialized Earth Moving Equipment (Other Than Conventional Type on-the-Road Trucks and Semi-Trailers, Including Euclids)	31.44	28.78 + a
17h) Heavy Duty Trailer up to 40 tons	32.39	28.78 + a

As of: October 28, 2022

17i) Snorkle Truck	31.54	28.78 + a
18) Sprinkler Fitter (Trade License required: F-1,2,3,4)	47.55	28.96 + a
19) Theatrical Stage Journeyman	25.76	7.34

Welders: Rate for craft to which welding is incidental.

**Note: Hazardous waste removal work receives additional \$1.25 per hour for truck drivers.*

***Note: Hazardous waste premium \$3.00 per hour over classified rate*

Crane with 150 ft. boom (including jib) - \$1.50 extra

Crane with 200 ft. boom (including jib) - \$2.50 extra

Crane with 250 ft. boom (including jib) - \$5.00 extra

Crane with 300 ft. boom (including jib) - \$7.00 extra

Crane with 400 ft. boom (including jib) - \$10.00 extra

All classifications that indicate a percentage of the fringe benefits must be calculated at the percentage rate times the "base hourly rate".

Apprentices duly registered under the Commissioner of Labor's regulations on "Work Training Standards for Apprenticeship and Training Programs" Section 31-51-d-1 to 12, are allowed to be paid the appropriate percentage of the prevailing journeymen hourly base and the full fringe benefit rate, providing the work site ratio shall not be less than one full-time journeyman instructing and supervising the work of each apprentice in a specific trade.

The Prevailing wage rates applicable to this project are subject to annual adjustments each July 1st for the duration of the project.

Each contractor shall pay the annual adjusted prevailing wage rate that is in effect each July 1st, as posted by the Department of Labor.

It is the contractor's responsibility to obtain the annual adjusted prevailing wage rate increases directly from the Department of Labor's website.

The annual adjustments will be posted on the Department of Labor's Web page:

www.ct.gov/dol. For those without internet access, please contact the division listed below.

The Department of Labor will continue to issue the initial prevailing wage rate schedule to the Contracting Agency for the project.

All subsequent annual adjustments will be posted on our Web Site for contractor access.

Contracting Agencies are under no obligation pursuant to State labor law to pay any increase due to the annual adjustment provision.

Effective October 1, 2005 - Public Act 05-50: any person performing the work of any mechanic, laborer, or worker shall be paid prevailing wage

All Person who perform work ON SITE must be paid prevailing wage for the appropriate mechanic, laborer, or worker classification.

All certified payrolls must list the hours worked and wages paid to All Persons who perform work ON SITE regardless of their ownership i.e.: (Owners, Corporate Officers, LLC Members, Independent Contractors, et. al)

Reporting and payment of wages is required regardless of any contractual relationship alleged to exist between the contractor and such person.

~~Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clause (29 CFR 5.5 (a) (1) (ii)).

Please direct any questions which you may have pertaining to classification of work and payment of prevailing wages to the Wage and Workplace Standards Division, telephone (860)263-6790.

As of: October 28, 2022

As of: October 28, 2022

**Connecticut Department of Labor
Wage and Workplace Standards Division
FOOTNOTES**

⇒ Please Note: If the “Benefits” listed on the schedule for the following occupations includes a letter(s) (+ a or + a+b for instance), refer to the information below.

Benefits to be paid at the appropriate prevailing wage rate for the listed occupation.

If the “Benefits” section for the occupation lists only a dollar amount, disregard the information below.

Bricklayers, Cement Masons, Cement Finishers, Concrete Finishers, Stone Masons
(Building Construction) and
(Residential- Hartford, Middlesex, New Haven, New London and Tolland Counties)

- a. Paid Holiday: Employees shall receive 4 hours for Christmas Eve holiday provided the employee works the regularly scheduled day before and after the holiday. Employers may schedule work on Christmas Eve and employees shall receive pay for actual hours worked in addition to holiday pay.

Elevator Constructors: Mechanics

- a. Paid Holidays: New Year’s Day, Memorial Day, Independence Day, Labor Day, Veterans’ Day, Thanksgiving Day, Christmas Day, plus the Friday after Thanksgiving.
- b. Vacation: Employer contributes 8% of basic hourly rate for 5 years or more of service or 6% of basic hourly rate for 6 months to 5 years of service as vacation pay credit.

Glaziers

- a. Paid Holidays: Labor Day and Christmas Day.

Power Equipment Operators
(Heavy and Highway Construction & Building Construction)

- a. Paid Holidays: New Year’s Day, Good Friday, Memorial day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day, provided the employee works 3 days during the week in which the holiday falls, if scheduled, and if scheduled, the working day before and the working day after the holiday. Holidays falling on Saturday may be observed on Saturday, or if the employer so elects, on the preceding Friday.

Ironworkers

- a. Paid Holiday: Labor Day provided employee has been on the payroll for the 5 consecutive work days prior to Labor Day.

Laborers (Tunnel Construction)

- a. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day. No employee shall be eligible for holiday pay when he fails, without cause, to work the regular work day preceding the holiday or the regular work day following the holiday.

Roofers

- a. Paid Holidays: July 4th, Labor Day, and Christmas Day provided the employee is employed 15 days prior to the holiday.

Sprinkler Fitters

- a. Paid Holidays: Memorial Day, July 4th, Labor Day, Thanksgiving Day and Christmas Day, provided the employee has been in the employment of a contractor 20 working days prior to any such paid holiday.

Truck Drivers

(Heavy and Highway Construction & Building Construction)

- a. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas day, and Good Friday, provided the employee has at least 31 calendar days of service and works the last scheduled day before and the first scheduled day after the holiday, unless excused.

STATUTE 31-55a

- SPECIAL NOTICE -

To All State and Political Subdivisions, Their Agents, and Contractors Connecticut General Statute 31-55a - Annual adjustments to wage rates by contractors doing state work.

Each contractor that is awarded a contract on or after October 1, 2002, for (1) the construction of a state highway or bridge that falls under the provisions of section 31-54 of the general statutes, or (2) the construction, remodeling, refinishing, refurbishing, rehabilitation, alteration or repair of any public works project that falls under the provisions of section 31-53 of the general statutes shall contact the Labor Commissioner on or before July first of each year, for the duration of such contract, to ascertain the prevailing rate of wages on an hourly basis and the amount of payment or contributions paid or payable on behalf of each mechanic, laborer or worker employed upon the work contracted to be done, and shall make any necessary adjustments to such prevailing rate of wages and such payment or contributions paid or payable on behalf of each such employee, effective each July first.

- The prevailing wage rates applicable to any contract or subcontract awarded on or after October 1, 2002 are subject to annual adjustments each July 1st for the duration of any project which was originally advertised for bids on or after October 1, 2002.
- Each contractor affected by the above requirement shall pay the annual adjusted prevailing wage rate that is in effect each July 1st, as posted by the Department of Labor.
- It is the **contractor's** responsibility to obtain the annual adjusted prevailing wage rate increases directly from the Department of Labor's Web Site. The annual adjustments will be posted on the Department of Labor Web page: www.ctdol.state.ct.us. For those without internet access, please contact the division listed below.
- The Department of Labor will continue to issue the initial prevailing wage rate schedule to the Contracting Agency for the project. All subsequent annual adjustments will be posted on our Web Site for contractor access.

Any questions should be directed to the Contract Compliance Unit, Wage and Workplace Standards Division, Connecticut Department of Labor, 200 Folly Brook Blvd., Wethersfield, CT 06109 at (860)263-6790.

Information Bulletin ***Occupational Classifications***

The Connecticut Department of Labor has the responsibility to properly determine "job classification" on prevailing wage projects covered under C.G.S. Section 31-53(d).

Note: This information is intended to provide a sample of some occupational classifications for guidance purposes only. It is not an all-inclusive list of each occupation's duties. This list is being provided only to highlight some areas where a contractor may be unclear regarding the proper classification. If unsure, the employer should seek guidelines for CTDOL.

Below are additional clarifications of specific job duties performed for certain classifications:

- **ASBESTOS WORKERS**

Applies all insulating materials, protective coverings, coatings and finishes to all types of mechanical systems.

- **ASBESTOS INSULATOR**

Handle, install apply, fabricate, distribute, prepare, alter, repair, dismantle, heat and frost insulation, including penetration and fire stopping work on all penetration fire stop systems.

- **BOILERMAKERS**

Erects hydro plants, incomplete vessels, steel stacks, storage tanks for water, fuel, etc. Builds incomplete boilers, repairs heat exchanges and steam generators.

- **BRICKLAYERS, CEMENT MASONS, CEMENT FINISHERS, MARBLE MASONS, PLASTERERS, STONE MASONS, PLASTERERS. STONE MASONS, TERRAZZO WORKERS, TILE SETTERS**

Lays building materials such as brick, structural tile and concrete cinder, glass, gypsum, terra cotta block. Cuts, tools and sets marble, sets stone, finishes concrete, applies decorative steel, aluminum and plastic tile, applies cements, sand, pigment and marble chips to floors, stairways, etc.

- **CARPENTERS, MILLWRIGHTS. PILEDRIVERMEN. LATHERS. RESILEINT FLOOR LAYERS, DOCK BUILDERS, DIKERS, DIVER TENDERS**

Constructs, erects, installs and repairs structures and fixtures of wood, plywood and wallboard. Installs, assembles, dismantles, moves industrial machinery. Drives piling into ground to provide foundations for structures such as buildings and bridges, retaining walls for earth embankments, such as cofferdams. Fastens wooden, metal or rockboard lath to walls, ceilings and partitions of buildings, acoustical tile layer, concrete form builder. Applies firestopping materials on fire resistive joint systems only. Installation of curtain/window walls only where attached to wood or metal studs. Installation of insulated material of all types whether blown, nailed or attached in other ways to walls, ceilings and floors of buildings. Assembly and installation of modular furniture/furniture systems. Free-standing furniture is not covered. This includes free standing: student chairs, study top desks, book box desks, computer furniture, dictionary stand, atlas stand, wood shelving, two-position information access station, file cabinets, storage cabinets, tables, etc.

- **LABORER, CLEANING**

- The clean up of any construction debris and the general (heavy/light) cleaning, including sweeping, wash down, mopping, wiping of the construction facility and its furniture, washing, polishing, and dusting.

- **DELIVERY PERSONNEL**

- If delivery of supplies/building materials is to one common point and stockpiled there, prevailing wages are not required. If the delivery personnel are involved in the distribution of the material to multiple locations within the construction site then they would have to be paid prevailing wages for the type of work performed: laborer, equipment operator, electrician, ironworker, plumber, etc.

- An example of this would be where delivery of drywall is made to a building and the delivery personnel distribute the drywall from one "stockpile" location to further sub-locations on each floor. Distribution of material around a construction site is the job of a laborer or tradesman, and not a delivery personnel.

- **ELECTRICIANS**

Install, erect, maintenance, alteration or repair of any wire, cable, conduit, etc., which generates, transforms, transmits or uses electrical energy for light, heat, power or other purposes, including the Installation or maintenance of telecommunication, LAN wiring or computer equipment, and low voltage wiring. ***License required per Connecticut General Statutes: E-1,2 L-5,6 C-5,6 T-1,2 L-1,2 V-1,2,7,8,9.**

- **ELEVATOR CONSTRUCTORS**

Install, erect, maintenance and repair of all types of elevators, escalators, dumb waiters and moving walks. **License required by Connecticut General Statutes: R-1,2,5,6.*

- **FORK LIFT OPERATOR**

Laborers Group 4) Mason Tenders - operates forklift solely to assist a mason to a maximum height of nine (9) feet only.

Power Equipment Operator Group 9 - operates forklift to assist any trade, and to assist a mason to a height over nine (9) feet.

- **GLAZIERS**

Glazing wood and metal sash, doors, partitions, and 2 story aluminum storefronts. Installs glass windows, skylights, store fronts and display cases or surfaces such as building fronts, interior walls, ceilings and table tops and metal store fronts. Installation of aluminum window walls and curtain walls is the "joint" work of glaziers and ironworkers, which require equal composite workforce.

- **IRONWORKERS**

Erection, installation and placement of structural steel, precast concrete, miscellaneous iron, ornamental iron, metal curtain wall, rigging and reinforcing steel. Handling, sorting, and installation of reinforcing steel (rebar). Metal bridge rail (traffic), metal bridge handrail, and decorative security fence installation. Installation of aluminum window walls and curtain walls is the "joint" work of glaziers and ironworkers which require equal composite workforce.

- **INSULATOR**

- Installing fire stopping systems/materials for "Penetration Firestop Systems": transit to cables, electrical conduits, insulated pipes, sprinkler pipe penetrations, ductwork behind radiation, electrical cable trays, fire rated pipe penetrations, natural polypropylene, HVAC ducts, plumbing bare metal, telephone and communication wires, and boiler room ceilings.

- **LABORERS**

Acetylene burners, asphalt rakers, chain saw operators, concrete and power buggy operator, concrete saw operator, fence and guard rail erector (except metal bridge rail (traffic), decorative security fence (non-metal)).

installation.), hand operated concrete vibrator operator, mason tenders, pipelayers (installation of storm drainage or sewage lines on the street only), pneumatic drill operator, pneumatic gas and electric drill operator, powermen and wagon drill operator, air track operator, block paver, curb setters, blasters, concrete spreaders.

- **PAINTERS**

Maintenance, preparation, cleaning, blasting (water and sand, etc.), painting or application of any protective coatings of every description on all bridges and appurtenances of highways, roadways, and railroads. Painting, decorating, hardwood finishing, paper hanging, sign writing, scenic art work and drywall hhg for any and all types of building and residential work.

- **LEAD PAINT REMOVAL**

- Painter's Rate

1. Removal of lead paint from bridges.
2. Removal of lead paint as preparation of any surface to be repainted.
3. Where removal is on a Demolition project prior to reconstruction.

- Laborer's Rate

1. Removal of lead paint from any surface NOT to be repainted.
2. Where removal is on a *TOTAL* Demolition project only.

- **PLUMBERS AND PIPEFITTERS**

Installation, repair, replacement, alteration or maintenance of all plumbing, heating, cooling and piping. ****License required per Connecticut General Statutes: P-1,2,6,7,8,9 J-1,2,3,4 SP-1,2 S-1,2,3,4,5,6,7,8 B-1,2,3,4 D-1,2,3,4.***

- **POWER EQUIPMENT OPERATORS**

Operates several types of power construction equipment such as compressors, pumps, hoists, derricks, cranes, shovels, tractors, scrapers or motor graders, etc. Repairs and maintains equipment. ****License required, crane operators only, per Connecticut General Statutes.***

- **ROOFERS**

Covers roofs with composition shingles or sheets, wood shingles, slate or asphalt and gravel to waterproof roofs, including preparation of surface. (demolition or removal of any type of roofing and or clean-up of any and all areas where a roof is to be relaid.)

- **SHEETMETAL WORKERS**

Fabricate, assembles, installs and repairs sheetmetal products and equipment in such areas as ventilation, air-conditioning, warm air heating, restaurant equipment, architectural sheet metal work, sheetmetal roofing, and aluminum gutters. Fabrication, handling, assembling, erecting, altering, repairing, etc. of coated metal material panels and composite metal material panels when used on building exteriors and interiors as soffits, fascia, louvers, partitions, canopies, cornice, column covers, awnings, beam covers, cladding, sun shades, lighting troughs, spires, ornamental roofing, metal ceilings, mansards, copings, ornamental and ventilation hoods, vertical and horizontal siding panels, trim, etc. The sheet metal classification also applies to the vast variety of coated metal material panels and composite metal material panels that have evolved over the years as an alternative to conventional ferrous and non-ferrous metals like steel, iron, tin, copper, brass, bronze, aluminum, etc. Fabrication, handling, assembling, erecting, altering, repairing, etc. of architectural metal roof, standing seam roof, composite metal roof, metal and composite bathroom/toilet partitions, aluminum gutters, metal and composite lockers and shelving, kitchen equipment, and walk-in coolers. To include testing and air –balancing ancillary to installation and construction.

- **SPRINKLER FITTERS**

Installation, alteration, maintenance and repair of fire protection sprinkler systems.

****License required per Connecticut General Statutes: F-1,2,3,4.***

- **TILE MARBLE AND TERRAZZO FINISHERS**

Assists and tends the tile setter, marble mason and terrazzo worker in the performance of their duties.

- **TRUCK DRIVERS**

~How to pay truck drivers delivering asphalt is under REVISION~

Truck Drivers are requires to be paid prevailing wage for time spent "working" directly on the site. These drivers remain covered by the prevailing wage for any time spent transporting between the actual construction location and facilities (such as fabrication, plants, mobile factories, batch plant, borrow pits, job headquarters, tool yards, etc.) dedicated exclusively, or nearly so, to performance of the contract or project, which are so located in proximity to the actual construction location that it is reasonable to include them. ****License required, drivers only, per Connecticut General Statutes.***

For example:

- Material men and deliverymen are not covered under prevailing wage as long as they are not directly involved in the construction process. If, they unload the material, they would then be covered by prevailing wage for the classification they are performing work in: laborer, equipment operator, etc.
- Hauling material off site is not covered provided they are not dumping it at a location outlined above.
- Driving a truck on site and moving equipment or materials on site would be considered covered work, as this is part of the construction process.

➤ *Any questions regarding the proper classification should be directed to:*
Public Contract Compliance Unit
Wage and Workplace Standards Division
Connecticut Department of Labor
200 Folly Brook Blvd, Wethersfield, CT 06109
(860) 263-6543.

Sec. 31-53b. Construction safety and health course. New miner training program. Proof of completion required for mechanics, laborers and workers on public works projects. Enforcement. Regulations. Exceptions. (a) Each contract for a public works project entered into on or after July 1, 2009, by the state or any of its agents, or by any political subdivision of the state or any of its agents, described in subsection (g) of section 31-53, shall contain a provision requiring that each contractor furnish proof with the weekly certified payroll form for the first week each employee begins work on such project that any person performing the work of a mechanic, laborer or worker pursuant to the classifications of labor under section 31-53 on such public works project, pursuant to such contract, has completed a course of at least ten hours in duration in construction safety and health approved by the federal Occupational Safety and Health Administration or, has completed a new miner training program approved by the Federal Mine Safety and Health Administration in accordance with 30 CFR 48 or, in the case of telecommunications employees, has completed at least ten hours of training in accordance with 29 CFR 1910.268.

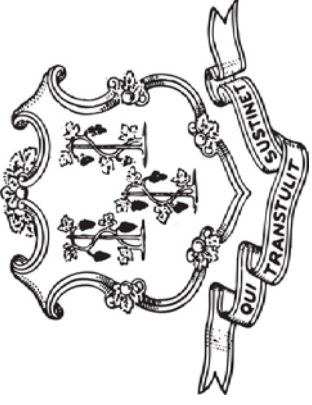
(b) Any person required to complete a course or program under subsection (a) of this section who has not completed the course or program shall be subject to removal from the worksite if the person does not provide documentation of having completed such course or program by the fifteenth day after the date the person is found to be in noncompliance. The Labor Commissioner or said commissioner's designee shall enforce this section.

(c) Not later than January 1, 2009, the Labor Commissioner shall adopt regulations, in accordance with the provisions of chapter 54, to implement the provisions of subsections (a) and (b) of this section. Such regulations shall require that the ten-hour construction safety and health courses required under subsection (a) of this section be conducted in accordance with federal Occupational Safety and Health Administration Training Institute standards, or in accordance with Federal Mine Safety and Health Administration Standards or in accordance with 29 CFR 1910.268, as appropriate. The Labor Commissioner shall accept as sufficient proof of compliance with the provisions of subsection (a) or (b) of this section a student course completion card issued by the federal Occupational Safety and Health Administration Training Institute, or such other proof of compliance said commissioner deems appropriate, dated no earlier than five years before the commencement date of such public works project.

(d) This section shall not apply to employees of public service companies, as defined in section 16-1, or drivers of commercial motor vehicles driving the vehicle on the public works project and delivering or picking up cargo from public works projects provided they perform no labor relating to the project other than the loading and unloading of their cargo.

(P.A. 06-175, S. 1; P.A. 08-83, S. 1.)

History: P.A. 08-83 amended Subsec. (a) by making provisions applicable to public works project contracts entered into on or after July 1, 2009, replacing provision re total cost of work with reference to Sec. 31-53(g), requiring proof in certified payroll form that new mechanic, laborer or worker has completed a 10-hour or more construction safety course and adding provision re new miner training program, amended Subsec. (b) by substituting "person" for "employee" and adding "or program", amended Subsec. (c) by adding "or in accordance with Federal Mine Safety and Health Administration Standards" and setting new deadline of January 1, 2009, deleted former Subsec. (d) re "public building", added new Subsec. (d) re exemptions for public service company employees and delivery drivers who perform no labor other than delivery and made conforming and technical changes, effective January 1, 2009.



THIS IS A PUBLIC WORKS PROJECT

Covered by the

PREVAILING WAGE LAW

CT General Statutes Section 31-53

**If you have QUESTIONS regarding your wages
CALL (860) 263-6790**

Section 31-55 of the CT State Statutes requires every contractor or subcontractor performing work for the state to post in a prominent place the prevailing wages as determined by the Labor Commissioner.

Informational Bulletin

THE 10-HOUR OSHA CONSTRUCTION SAFETY AND HEALTH COURSE

(applicable to public building contracts entered into *on or after July 1, 2007*, where the total cost of all work to be performed is at least \$100,000)

- (1) This requirement was created by Public Act No. 06-175, which is codified in Section 31-53b of the Connecticut General Statutes (pertaining to the prevailing wage statutes);
- (2) The course is required for public building construction contracts (projects funded in whole or in part by the state or any political subdivision of the state) entered into on or after July 1, 2007;
- (3) It is required of private employees (not state or municipal employees) and apprentices who perform manual labor for a general contractor or subcontractor on a public building project where the total cost of all work to be performed is at least \$100,000;
- (4) The ten-hour construction course pertains to the ten-hour Outreach Course conducted in accordance with federal OSHA Training Institute standards, and, for telecommunications workers, a ten-hour training course conducted in accordance with federal OSHA standard, 29 CFR 1910.268;
- (5) The internet website for the federal OSHA Training Institute is http://www.osha.gov/fso/ote/training/edcenters/fact_sheet.html;
- (6) The statutory language leaves it to the contractor and its employees to determine who pays for the cost of the ten-hour Outreach Course;
- (7) Within 30 days of receiving a contract award, a general contractor must furnish proof to the Labor Commissioner that all employees and apprentices performing manual labor on the project will have completed such a course;
- (8) Proof of completion may be demonstrated through either: (a) the presentation of a *bona fide* student course completion card issued by the federal OSHA Training Institute; *or* (2) the presentation of documentation provided to an employee by a trainer certified by the Institute pending the actual issuance of the completion card;
- (9) Any card with an issuance date more than 5 years prior to the commencement date of the construction project shall not constitute proof of compliance;

- (10) Each employer shall affix a copy of the construction safety course completion card to the certified payroll submitted to the contracting agency in accordance with Conn. Gen. Stat. § 31-53(f) on which such employee's name first appears;
- (11) Any employee found to be in non-compliance shall be subject to removal from the worksite if such employee does not provide satisfactory proof of course completion to the Labor Commissioner by the fifteenth day after the date the employee is determined to be in noncompliance;
- (12) Any such employee who is determined to be in noncompliance may continue to work on a public building construction project for a maximum of fourteen consecutive calendar days while bringing his or her status into compliance;
- (13) The Labor Commissioner may make complaint to the prosecuting authorities regarding any employer or agent of the employer, or officer or agent of the corporation who files a false certified payroll with respect to the status of an employee who is performing manual labor on a public building construction project;
- (14) The statute provides the minimum standards required for the completion of a safety course by manual laborers on public construction contracts; any contractor can exceed these minimum requirements; and
- (15) Regulations clarifying the statute are currently in the regulatory process, and shall be posted on the CTDOL website as soon as they are adopted in final form.
- (16) Any questions regarding this statute may be directed to the Wage and Workplace Standards Division of the Connecticut Labor Department via the internet website of <http://www.ctdol.state.ct.us/wgwkstnd/wgemenu.htm>; or by telephone at (860)263-6790.

THE ABOVE INFORMATION IS PROVIDED EXCLUSIVELY AS AN EDUCATIONAL RESOURCE, AND IS NOT INTENDED AS A SUBSTITUTE FOR LEGAL INTERPRETATIONS WHICH MAY ULTIMATELY ARISE CONCERNING THE CONSTRUCTION OF THE STATUTE OR THE REGULATIONS.

November 29, 2006

Notice
To All Mason Contractors and Interested Parties
Regarding Construction Pursuant to Section 31-53 of the
Connecticut General Statutes (Prevailing Wage)

The Connecticut Labor Department Wage and Workplace Standards Division is empowered to enforce the prevailing wage rates on projects covered by the above referenced statute.

Over the past few years the Division has withheld enforcement of the rate in effect for workers who operate a forklift on a prevailing wage rate project due to a potential jurisdictional dispute.

The rate listed in the schedules and in our Occupational Bulletin (see enclosed) has been as follows:

Forklift Operator:

- **Laborers (Group 4) Mason Tenders** - operates forklift solely to assist a mason to a maximum height of nine feet only.
- **Power Equipment Operator (Group 9)** - operates forklift to assist any trade and to assist a mason to a height over nine feet.

The U.S. Labor Department conducted a survey of rates in Connecticut but it has not been published and the rate in effect remains as outlined in the above Occupational Bulletin.

Since this is a classification matter and not one of jurisdiction, effective January 1, 2007 the Connecticut Labor Department will enforce the rate on each schedule in accordance with our statutory authority.

Your cooperation in filing appropriate and accurate certified payrolls is appreciated.

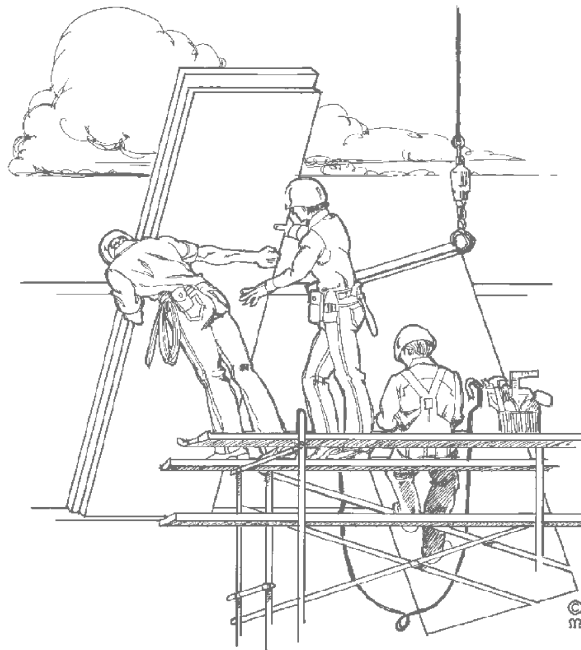
~NOTICE~

TO ALL CONTRACTING AGENCIES

Please be advised that Connecticut General Statutes Section 31-53, requires the contracting agency to certify to the Department of Labor, the total dollar amount of work to be done in connection with such public works project, regardless of whether such project consists of one or more contracts.

Please find the attached “Contracting Agency Certification Form” to be completed and returned to the Department of Labor, Wage and Workplace Standards Division, Public Contract Compliance Unit.

 Inquiries can be directed to (860)263-6543.



CONNECTICUT DEPARTMENT OF LABOR
WAGE AND WORKPLACE STANDARDS DIVISION
CONTRACT COMPLIANCE UNIT

CONTRACTING AGENCY CERTIFICATION FORM

I, _____, acting in my official capacity as _____,
authorized representative title

for _____, located at _____,
contracting agency address

do hereby certify that the total dollar amount of work to be done in connection with
_____, located at _____,
project name and number address

shall be \$_____, which includes all work, regardless of whether such project
consists of one or more contracts.

CONTRACTOR INFORMATION

Name: _____

Address: _____

Authorized Representative: _____

Approximate Starting Date: _____

Approximate Completion Date: _____

Signature

Date

Return To: Connecticut Department of Labor
Wage & Workplace Standards Division
Contract Compliance Unit
200 Folly Brook Blvd.
Wethersfield, CT 06109

Date Issued: _____

[New] In accordance with Section 31-53b(a) of the C.G.S. each contractor shall provide a copy of the OSHA 10 Hour Construction Safety and Health Card for each employee, to be attached to the first certified payroll on the project.

PAYROLL CERTIFICATION FOR PUBLIC WORKS PROJECTS
WEEKLY PAYROLL
 Connecticut Department of Labor
 Wage and Workplace Standards Division
 200 Folly Brook Blvd.
 Wethersfield, CT 06109

CONTRACTOR NAME AND ADDRESS: _____
 PROJECT NAME & ADDRESS: _____
 WORKER'S COMPENSATION INSURANCE CARRIER: _____
 POLICY #: _____
 EFFECTIVE DATE: _____
 EXPIRATION DATE: _____

PERSON/WORKER, ADDRESS and SECTION	Week-Ending Date	APPR RATE %	MALE/ FEMALE AND RACE*	WORK CLASSIFICATION Trade License Type & Number - OSHA 10 Certification Number	DAY AND DATE							Total ST Hours	Total O/T Hours	BASE HOURLY RATE	TYPE OF FRINGE BENEFITS Per Hour 1 through 6 (see back)	GROSS PAY FOR ALL WORK PERFORMED THIS WEEK	TOTAL DEDUCTIONS			GROSS PAY FOR THIS PREVAILING RATE JOB	CHECK # AND NET PAY		
					S	M	T	W	TH	F	S						FICA	FEDERAL STATE	WITH- HOLDING			WITH- HOLDING	LIST OTHER

OSHA 10 ~ ATTACH CARD TO 1ST CERTIFIED PAYROLL

***FRINGE BENEFITS EXPLANATION (P):**

Bona fide benefits paid to approved plans, funds or programs, except those required by Federal or State Law (unemployment tax, worker’s compensation, income taxes, etc.).

Please specify the type of benefits provided:

- 1) Medical or hospital care _____
- 2) Pension or retirement _____
- 3) Life Insurance _____
- 4) Disability _____
- 5) Vacation, holiday _____
- 6) Other (please specify) _____

CERTIFIED STATEMENT OF COMPLIANCE

For the week ending date of _____,

I, _____ of _____, (hereafter known as

Employer) in my capacity as _____ (title) do hereby certify and state:

Section A:

1. All persons employed on said project have been paid the full weekly wages earned by them during the week in accordance with Connecticut General Statutes, section 31-53, as amended. Further, I hereby certify and state the following:

- a) The records submitted are true and accurate;
- b) The rate of wages paid to each mechanic, laborer or workman and the amount of payment or contributions paid or payable on behalf of each such employee to any employee welfare fund, as defined in Connecticut General Statutes, section 31-53 (h), are not less than the prevailing rate of wages and the amount of payment or contributions paid or payable on behalf of each such employee to any employee welfare fund, as determined by the Labor Commissioner pursuant to subsection Connecticut General Statutes, section 31-53 (d), and said wages and benefits are not less than those which may also be required by contract;
- c) The Employer has complied with all of the provisions in Connecticut General Statutes, section 31-53 (and Section 31-54 if applicable for state highway construction);
- d) Each such employee of the Employer is covered by a worker’s compensation insurance policy for the duration of his employment which proof of coverage has been provided to the contracting agency;
- e) The Employer does not receive kickbacks, which means any money, fee, commission, credit, gift, gratuity, thing of value, or compensation of any kind which is provided directly or indirectly, to any prime contractor, prime contractor employee, subcontractor, or subcontractor employee for the purpose of improperly obtaining or rewarding favorable treatment in connection with a prime contract or in connection with a prime contractor in connection with a subcontractor relating to a prime contractor; and
- f) The Employer is aware that filing a certified payroll which he knows to be false is a class D felony for which the employer may be fined up to five thousand dollars, imprisoned for up to five years or both.

2. OSHA~The employer shall affix a copy of the construction safety course, program or training completion document to the certified payroll required to be submitted to the contracting agency for this project on which such employee’s name first appears.

 (Signature) (Title) Submitted on (Date)

Section B: Applies to CONNDOT Projects ONLY

That pursuant to CONNDOT contract requirements for reporting purposes only, all employees listed under Section B who performed work on this project are not covered under the prevailing wage requirements defined in Connecticut General Statutes Section 31-53.

 (Signature) (Title) Submitted on (Date)

Note: CTDOL will assume all hours worked were performed under Section A unless clearly delineated as Section B WWS-CP1 as such. Should an employee perform work under both Section A and Section B, the hours worked and wages paid must be segregated for reporting purposes.

*****THIS IS A PUBLIC DOCUMENT***
DO NOT INCLUDE SOCIAL SECURITY NUMBERS**

WEEKLY PAYROLL CERTIFICATION FOR PUBLIC WORKS PROJECTS

Weekly Payroll Certification For Public Works Projects (Continued)

Week-Ending Date: _____
Contractor or Subcontractor Business Name: _____

WEEKLY PAYROLL

PERSON/WORKER, ADDRESS and SECTION	APPR RATE %	MALE/FEMALE AND RACE*	WORK CLASSIFICATION <small>Trade License Type & Number - OSHA 10 Certification Number</small>	DAY AND DATE							Total ST Hours	Total O/T Hours	BASE HOURLY RATE	TYPE OF FRINGE BENEFITS Per Hour 1 through 6 (see back)	GROSS PAY FOR ALL WORK PERFORMED THIS WEEK	TOTAL DEDUCTIONS			GROSS PAY FOR THIS PREVAILING RATE JOB	CHECK # AND NET PAY								
				S	M	T	W	TH	F	S						FICA WITH-HOLDING	STATE WITH-HOLDING	LIST OTHER										
				HOURS WORKED EACH DAY																								
												1. \$																
											\$	2. \$																
											Base Rate	3. \$																
											\$	4. \$																
											Cash Fringe	5. \$																
											Cash Fringe	6. \$																
											\$	1. \$																
											Base Rate	2. \$																
											\$	3. \$																
											Base Rate	4. \$																
											\$	5. \$																
											Cash Fringe	6. \$																
											\$	1. \$																
											Base Rate	2. \$																
											\$	3. \$																
											Base Rate	4. \$																
											\$	5. \$																
											Cash Fringe	6. \$																
											\$	1. \$																
											Base Rate	2. \$																
											\$	3. \$																
											Base Rate	4. \$																
											\$	5. \$																
											Cash Fringe	6. \$																

CHESHIRE PUBLIC SCHOOLS

2022-2023 School Calendar

2022				
AUGUST				
M	T	W	Th	F
1	2	3	4	5
8	9	10	11	12
15	16	17	18	19
22	23	24	25	26
29	[30]	31		

2022				
SEPTEMBER				
M	T	W	Th	F
			1	2
5	6	7	8	9
12	13	14	15	16
19	20	21	22	23
26	27	28	29*	30

2022				
OCTOBER				
M	T	W	Th	F
3	4	5	6	7
10	<11>	<12>	<13>	14
17	<18>	19	<20>	21
24	<25>	26	<27>	28
31				

2022				
NOVEMBER				
M	T	W	Th	F
	1	2	3	4
7	8	9	10	11
14	15	16	17	18
21	22	23*	24	25
28	29	30		

2022				
DECEMBER				
M	T	W	Th	F
			1	<2>
5	6	7	8	9
12	13	14	15	16
19	20	21	22*	23
26	27	28	29	30

Snow days will be made up June 14-30 (13 days). Additional snow days needed beyond these 13 days will begin with April 14 and move backward.

2023				
JANUARY				
M	T	W	Th	F
2	3	4	5	6
9	10**	11	12	13*
16	17	18	19	20
23	24	25	26	27
30	31			

2023				
FEBRUARY				
M	T	W	Th	F
		1	2	3
6	7	8*	9	10
13	14	15	16	<17>
20	21	22	23	24
27	28			

2023				
MARCH				
M	T	W	Th	F
		1	2	3
6	7	8	9	10
13	14	15	<16>	17
20	<21>	22	<23>	24
27	28	29	30**	31

2023				
APRIL				
M	T	W	Th	F
3	4	5	6	7
10	11	12	13	14
17	18	19	20	21
24	25	26	27	28*

2023				
MAY				
M	T	W	Th	F
1	2	3	4	5
8	9	10	11	12
15	16	17	18	19
22	23	24	25	<26>
29	30	31		

2023				
JUNE				
M	T	W	Th	F
			1	2
5	6	7	8	9
12	[13*]	14	15	16
19	20	21	22	23
26	27	28	29	30

Aug. 25	Convocation/Staff Prep. Day
Aug. 26	Prof. Dev. Day
Aug. 29	Prof. Dev. Day
Aug. 30	First Day of School
Sept. 2, 5	Labor Day Break
Sept. 26	Rosh Hashanah
Sept. 29	Early Dismissal - All Schools - Professional Development
Oct. 5	Yom Kippur
Oct. 10	Columbus Day
Oct. 11	Early Dismissal - Dodd only - Parent Conferences
Oct. 12	Early Dismissal - CHS only - Parent Conferences
Oct. 13	Early Dismissal - Dodd only - Parent Conferences
Oct. 18	Early Dismissal - Dodd only - Parent Conferences
Oct. 20	Early Dismissal - PreK-6 only - Parent Conferences
Oct. 25	Early Dismissal - PreK-6 only - Parent Conferences
Oct. 27	Early Dismissal - PreK-6 only - Parent Conferences
Nov. 8	Prof. Dev. Day/Election Day
Nov. 23	Early Dismissal - all schools
Nov. 24-25	Thanksgiving Break
Dec. 2	Early Dismissal - PreK-6 only - Professional Development
Dec. 22	Early Dismissal - all schools
Dec. 23-Jan. 2	Winter Break
Jan. 10	Late Arrival - All Schools - Professional Development
Jan. 13	Early Dismissal - All Schools - Professional Development
Jan. 16	Martin Luther King, Jr. Day
Feb. 8	Early Dismissal - All Schools - Professional Development
Feb. 17	Early Dismissal - PreK-6 only - Professional Development
Feb. 20-21	Presidents' Day/February Break
Mar. 16	Early Dismissal - PreK-6 only - Parent Conferences
Mar. 17	Prof. Dev. Day
Mar. 21	Early Dismissal - PreK-6 only - Parent Conferences
Mar. 23	Early Dismissal - PreK-6 only - Parent Conferences
Mar. 30	Late Arrival - All Schools - Professional Development
Apr. 7	Good Friday
Apr. 10-14	Spring Break
Apr. 28	Early Dismissal - All Schools - Professional Development
May 26	Early Dismissal - PreK-6 only - Professional Development
May 29	Memorial Day
June 13	Projected Last Student Day
June 14	Projected Last Teacher Work Day

- [] First/Last Day of School for Students
- Prof. Devel. - No School for Students
- Vacation/Holiday - No School
- * Early Dismissal
- < > Early Dismissal-Designated School Only
- ** Late Arrival

CHESHIRE PUBLIC SCHOOLS

2023-2024 School Calendar - PROPOSED DRAFT

2023				
AUGUST				1 Days
M	T	W	Th	F
	1	2	3	4
7	8	9	10	11
14	15	16	17	18
21	22	23	24	25
28	29	30	[31]	

2023				
SEPTEMBER				19 Days
M	T	W	Th	F
				1
4	5	6	7	8
11	12	13	14	15
18	19	20	21	22
25	26	27	28	29

2023				
OCTOBER				21 Days
M	T	W	Th	F
2	3	4	5	6
9	10	11	12	13
16	17	18	19	20
23	24	25	26	27
30	31			

2023				
NOVEMBER				19 Days
M	T	W	Th	F
		1	2	3
6	7	8	9	10
13	14	15	16	17
20	21	22*	23	24
27	28	29	30	

2023				
DECEMBER				16 Days
M	T	W	Th	F
				1
4	5	6	7	8
11	12	13	14	15
18	19	20	21	22*
25	26	27	28	29

Snow days will be made up June 11-28 (14 days). Additional snow days needed beyond these 14 days will begin with April 12 and move backward.

2024				
JANUARY				21 Days
M	T	W	Th	F
1	2	3	4	5
8	9	10	11	12
15	16	17	18	19
22	23	24	25	26
29	30	31		

2024				
FEBRUARY				19 Days
M	T	W	Th	F
			1	2
5	6	7	8	9
12	13	14	15	16
19	20	21	22	23
26	27	28	29	

2024				
MARCH				19 Days
M	T	W	Th	F
				1
4	5	6	7	8
11	12	13	14	15
18	19	20	21	22
25	26	27	28	29

2024				
APRIL				17 Days
M	T	W	Th	F
1	2	3	4	5
8	9	10	11	12
15	16	17	18	19
22	23	24	25	26
29	30			

2024				
MAY				22 Days
M	T	W	Th	F
		1	2	3
6	7	8	9	10
13	14	15	16	17
20	21	22	23	24
27	28	29	30	31

2024				
JUNE				6 Days
M	T	W	Th	F
3	4	5	6	7
[10*]	11	12	13	14
17	18	19	20	21
24	25	26	27	28

Aug. 28	Convocation/Staff Prep. Day
Aug. 29	Prof. Dev. Day
Aug. 30	Prof. Dev. Day
Aug. 31	First Day of School
Sept. 4	Labor Day
Sept. 25	Yom Kippur
Oct. 9	Columbus Day
Nov. 7	Prof. Dev. Day/Election Day
Nov. 22	Early Dismissal - all schools
Nov.23-24	Thanksgiving Break
Dec. 22	Early Dismissal - all schools
Dec. 25-Jan. 1	Winter Break
Jan. 15	Martin Luther King, Jr. Day
Feb.19-20	Presidents' Day/February Break
Mar 15	Prof. Dev. Day
Mar. 29	Good Friday
Apr. 8 - 12	Spring Break
May 27	Memorial Day
June 10	Projected Last Student Day
June 11	Projected Last Teacher Work Day

- [] First/Last Day of School for Students
- Prof. Devel. - No School for Students
- Vacation/Holiday - No School
- * Early Dismissal
- <> Early Dismissal - Designated School Only

TOILET ROOM UPGRADES

DOOLITTLE ELEMENTARY SCHOOL
735 CORNWALL AVENUE
CHESHIRE, CT 06410
BID #2223-09

S/P+A PROJECT NO. 21.336

Drawing NumberDrawing Name

COVER SHEET

ARCHITECTURAL DRAWINGS

A001	GENERAL NOTES, LEGENDS & ABBREVIATIONS
A002-A100	NOT USED
A101	TOILET ROOM FLOOR PLANS & NOTES
A102	TOILET ROOM INTERIOR ELEVATIONS
A103	INTERIOR ELEVATIONS
A104-A249	NOT USED
A250	SCHEDULES & DETAILS

FIRE PROTECTION DRAWINGS

FP001	FIRE PROTECTION COVER SHEET
F002-F100	NOT USED
FP101	FIRE PROTECTION PLANS, DETAILS & SCHEDULES

PLUMBING DRAWINGS

P001	PLUMBING COVER SHEET
P002-P100	NOT USED
P101	PLUMBING PLANS
P102-P800	NOT USED
P801	PLUMBING DETAILS
P802-P900	NOT USED
P901	PLUMBING SCHEDULES

MECHANICAL DRAWINGS

M001	MECHANICAL NOTES, LEGENDS & ABBREVIATIONS
M002-M100	NOT USED
M101	MECHANICAL TOILET ROOM FLOOR PLANS & NOTES
M102-M200	NOT USED
M201	MECHANICAL DETAILS & SCHEDULES

ELECTRICAL DRAWINGS

E001	ABBREVIATIONS, NOTES, SYMBOLS & LIGHTING SCHEDULE
E002-E100	NOT USED
E101	TOILET ROOM ELECTRICAL PLANS & NOTES

END OF SECTION

SECTION 011000 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 PROJECT DESCRIPTION

- A. The Work of the Project is defined by the Contract Documents and consists of interior renovations to existing spaces within a school.

- B. The Work generally includes, but is not necessarily limited to the following major elements:

1. Removal of building materials and components, including selected existing plumbing, mechanical, and electrical systems.
2. Removal and offsite disposal of limited asbestos and hazardous materials.
3. Offsite disposal of all removed materials.
4. Renovation of existing spaces, including but not limiting to the following:
 - a. Demolition of existing CMU and stud walls.
 - b. Construction of new CMU partition walls and metal stud and gypsum board chase walls.
 - c. Removal and replacement of new toilet compartments and accessories.
 - d. Removal and replacement of flooring.
 - e. Removal and replacement of doors, frames, and hardware.
 - f. Provision and installation of ceramic wall tile and base and painting throughout.
 - g. Provision of cutting/boring and patching/firesafing for any new penetrations of any diameter.
5. Relocation of existing sprinkler heads as required due to ceiling revisions.
6. Revision of plumbing in toilet rooms in coordination with new architectural plans. Removal of all existing fixtures with reinstallation and provision of new, where indicated. Revision of piping as required.
7. Removal and replacement of existing controls, ductwork, piping, duct and pipe insulation, convectors, exhaust fans, roof curbs, and inlets and outlets. Provision of testing and balancing.
8. Electrical:
 - a. Removal of existing receptacles, fire alarm horns/strobes, and call-for-aid system.
 - b. Removal of existing lights and replacement with new LED fixtures.
 - c. Removal of existing occupancy sensors and replacement with new.
 - d. Provision and installation of a nurse call-for-aid system in non-gang bathrooms.
 - e. Interlock new occupancy sensors in toilet rooms with associated exhaust fans serving the room.
 - f. Provision and installation of power for new exhaust fans and hand dryers, once installed.

- g. Provision and installation of duct smoke detectors and fire alarm relays at smoke dampers. Provide power to dampers as well as wiring of duct smoke detectors and relays back to fire alarm control panel.
- h. Provision and installation of new public address speakers and connection to the existing speaker circuit in the corridor.

1.3 CONTRACTOR USE OF PREMISES

- A. General: Limit use of the premises to construction activities in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
- B. Confine operations to as small work areas and accessways as possible. As much as possible and without damage to the finishes, doors, and related building systems, access the project area via the service doors designated by Owner.
- C. Keep driveways and entrances serving the premises clear and available to the Owner and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.
- D. Maintain existing egress patterns, exit doors, and means of egress during construction, which will include the provision of temporary walkways, sidewalks, or other means necessary to provide adequate life safety for the building occupants, particularly at exitways which must continue to be open and serviceable while adjacent construction activity occurs.
- E. Use of the Existing Building: Maintain the existing building in a weathertight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period.
 - 1. Contractor is responsible to secure project area/site from intrusions during unoccupied (after hours) period of time. Any temporary doors and /or window coverings that may be necessary to complete repairs are the Contractors responsibility to furnish and install as part of the project scope.

1.4 OWNER OCCUPANCY

- A. Full Owner Occupancy: The Owner's administrative and maintenance staff will occupy the site and existing building during the entire construction period, with children on site during the school year. Cooperate with the Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with the Owner's operations. Pre-schedule construction operations with the Owner for areas that must be evacuated for extended periods, giving the Owner the opportunity to relocate administrative or educational operations to non-affected areas.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
 - 2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

- B. Utility Relocations: Schedule utility relocations that affect the building as early as possible. Coordinate Contractor's schedules with the utility companies and with the Owner to expedite the work while mitigating their interference with the Owner's operation of the building. Schedule protracted utility shutdowns over weekends to prevent any loss of use of building by Owner. Schedule and pay for overtime charges as required to complete the utility relocations and installations.

1.5 SPECIAL REQUIREMENTS

- A. The Contractor shall insure that all work performed is done so in a safe manner and that all his/her employees shall adhere to all applicable safety procedures and practices at all times. There may be children and staff in the vicinity of the work area during normal working hours. The Contractor shall be aware at all times that additional safety considerations should be taken. Particular care shall be taken by the Contractor, Subcontractors and all those in their employ, that all tools, equipment, ladders, etc. are never left unsupervised.
- B. Meaningful Instruction: Meaningful instruction (as determined by the Owner) must be facilitated and possible within the building at all times. This requirement may limit the Contractor's demolition and construction operations as the distraction represented by hammering, material movement, etc. may disrupt classes. No down time or mobilization charges will be permitted should the meaningful instruction requirement suspend the Contractor's operations for any length of time.
- C. Testing: During the school year, Smarter Balanced Assessment Consortium may be administered to portions of the student population, which requires absolute concentration on the part of the students. The Owner may prohibit operations during the administration of these assessments. Cooperate with the Owner to determine the schedule, locations of the testing and where operations may proceed with disrupting classroom or roofing operations.
- D. Under no circumstances shall the buildings' occupants be subjected to excessive construction noise or vibrations, nor shall they be subject to fumes, odors, or other deleterious effects of the operation. Should material delivery, demolition or construction operations, inclement weather or related schedule conditions produce this situation (as determined by the Owner), the Contractor shall be required to suspend operations that produce the offending effects until such time as the building is not occupied, or as approved by the Owner.
- E. Schedule:
 - 1. Work (meaning Shop Drawings and procurement) for the project can begin immediately after the contract signing however the on-site construction period cannot begin until school has been dismissed for the summer, (June 30, 2023, the earliest). Owner will provide Contractor a 30-day advanced notice of the exact start date based on the School Calendar and potential snow days.
 - 2. Work must be substantially complete by the time indicated in the Key Dates of the Standard Instructions to Bidders.
- F. Smoking will not be permitted inside the building or on the grounds. Strict adherence to the smoking regulations will be enforced for the entire duration of the construction.
- G. There will be absolutely **no** fraternizing with the students by construction personnel. Anyone caught doing so will be required to leave the jobsite and will not be permitted to return. Such

dismissal shall not give the contractor grounds for default on any other contract requirements, including the construction schedule.

H. Site Security – Identification Badges

1. The Contractor shall provide a list of all contact persons. The list shall include each trade, name of Contractor, contact person(s), phone numbers, fax numbers, Federal Employer Identification Number (FEIN), social security number if FEIN is not available, and Connecticut Tax Registration number.
2. Prior to the start of work all Contractor and Sub-Contractor personnel assigned to perform work shall be required to fill out and submit to a background check at a cost provided by the Contractor. All information shall be submitted to the Town of Cheshire. Information for background check includes the following:
 - a. Identity Verification
 - b. Criminal Background
 - c. Additional checks as deemed warranted
3. Security badges will be worn by all project personnel during construction activities. The Contractor will provide badges at no cost to the Owner. The Contractor will be responsible for monitoring the display of badges, including those of the personnel of all subcontractors and visitors to the project site.

I. Public Health Emergency:

1. The Contractor shall anticipate and incorporate in their Bids all potential costs related to a public health emergency such as the COVID-19/Coronavirus Pandemic, including rules, regulations, and recommendations issued by public authorities. The potential costs may include, but are not limited to, costs related to social distancing, manpower levels, project scheduling, construction coordination, material/product supplies and delivery delays, material escalation costs, increased subcontractor/supplier costs, loss of productivity and inefficiency costs, extended general conditions costs, and any other potential costs.
2. Bidder will provide a proactive company COVID-19 plan detailing the precautions taken for their employees and customers.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.
- B. Related Sections:
 - 1. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

1.3 DEFINITIONS

- A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

- A. A list of unit prices is included in the Bid Form.

END OF SECTION 012200

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract. No extensions of time shall be granted for accepted alternates.
- D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. **ADD ALTERNATE #1: Classroom 14 Toilet Room Work:** Add to the Base Bid the labor, material, and equipment to renovate the existing toilet room, closet, and coat rack space within Classroom 14. Refer to the Drawings for the complete scope of work in this area.
- B. **ADD ALTERNATE #2: Classroom 15 Toilet Room Work:** Add to the Base Bid the labor, material, and equipment to renovate the existing toilet room, closet, and coat rack space within Classroom 15. Refer to the Drawings for the complete scope of work in this area.
- C. **VOLUNTARY ALTERNATE #3: Voluntary Alternate:** Prepared at the Contractor's discretion, when an appreciable value is represented in the Owner's best interest, either "ADD" or "DEDUCT". Include complete information in a separate narrative or proposal on the alternate, including manufacturer's literature, schedule information, etc.

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Sections:
 - 1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
 - 2. Divisions 02 through 49 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 SUBMITTALS

- A. Substitution Requests: Submit three (3) copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use **CSI Form 1.5C, 13.1A**, or comparable form.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed, SIDE-BY-SIDE comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such

- as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
- d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names and addresses of Architects and Owners.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven (7) days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

- A. Coordination: Modify or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Procurement Substitution Request: Submit to Architect seven (7) days prior to date of bid opening.
- B. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than fifteen (15) days prior to time required for preparation and review of related submittals.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. If requested substitution involves more than one (1) contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- C. Substitutions for Convenience: Architect will consider requests for substitution if received within sixty (60) days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d. Substitution request is fully documented and properly submitted.
 - e. Requested substitution will not adversely affect Contractor's construction schedule.

- f. Requested substitution has received necessary approvals of authorities having jurisdiction.
- g. Requested substitution is compatible with other portions of the Work.
- h. Requested substitution has been coordinated with other portions of the Work.
- i. Requested substitution provides specified warranty.
- j. If requested substitution involves more than one (1) contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections:
 - 1. Section 016000 "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request or twenty (20) days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Quotation Form: Use forms acceptable to Architect.

- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to the Architect.
1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 4. Include costs of labor and supervision directly attributable to the change.
 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
 7. Proposal Request Form: Use form acceptable to Architect.

1.5 ADMINISTRATIVE CHANGE ORDERS

- A. Unit Price Adjustment: Refer to Section 012200 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit price work.

1.6 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.7 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

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 specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

- B. Related Sections:

- 1. Section 012200 "Unit Prices" for administrative requirements governing the use of unit prices.
- 2. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
- 3. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
- 4. Section 013300 "Submittal Procedures" for administrative requirements governing the preparation and submittal of the submittal schedule.

1.3 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

- 1. Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
- 2. Submit the schedule of values to Architect at earliest possible date but no later than seven (7) days before the date scheduled for submittal of initial Applications for Payment.

- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one (1) line item for each Specification Section.

- 1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.

- e. Date of submittal.
- 2. Arrange schedule of values consistent with format of AIA Document G703.
- 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent (5%) of Contract Sum.
- 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
- 5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
- 6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
- 7. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
- 8. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 or comparable form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.

2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
 5. Include updated and approved Contractor's construction schedule, potential Change Order Log and Product Submittal Log.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 3. Provide summary documentation for stored materials indicating the following:
 - a. Materials previously stored and included in previous Applications for Payment.
 - b. Work completed for this Application utilizing previously stored materials.
 - c. Additional materials stored with this Application.
 - d. Total materials remaining stored, including materials with this Application.
- F. Transmittal: Submit three (3) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One (1) copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule (preliminary if not final).
 4. Products list (preliminary if not final).
 5. Schedule of unit prices.
 6. Submittal schedule (preliminary if not final).
 7. List of Contractor's staff assignments.
 8. List of Contractor's principal consultants.
 9. Copies of building permits.
 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
 12. Report of preconstruction conference.
 13. Certificates of insurance and insurance policies.
 14. Performance and payment bonds.
 15. Data needed to acquire Owner's insurance.
- I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing one hundred percent (100%) completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

- 1. General project coordination procedures.
- 2. Administrative and supervisory personnel.
- 3. Coordination drawings.
- 4. Requests for Information (RFIs).
- 5. Project meetings.

- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

- C. Related Sections:

- 1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
- 2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
- 3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. RFI: Request from Owner, Architect, or Contractor seeking information from each other during construction.

1.4 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

- 1. Schedule construction operations in sequence required to obtain the best results where installation of one (1) part of the Work depends on installation of other components, before or after its own installation.
- 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
- 3. Make adequate provisions to accommodate items scheduled for later installation.

- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate Contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's construction schedule.
 - 2. Preparation of the schedule of values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Pre-installation conferences.
 - 7. Startup and adjustment of systems.
 - 8. Project closeout activities.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one (1) entity.
 - 1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to the coordination drawings by multiple Contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, mechanical and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.

- e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
- f. Indicate required installation sequences.
- g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

- 1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire protection, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
- 2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
- 3. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
- 4. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts, and electrical distribution equipment.
- 5. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1¼ inch diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire alarm locations.
 - c. Location of pull boxes and junction boxes, dimensioned from column center lines.
- 6. Fire Protection System: Show the following:
 - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
- 7. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility. If the Architect determines that the coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the Architect will so inform the Contractor, who shall make changes as directed and resubmit.
- 8. Coordination Drawing Prints: Prepare coordination drawing prints in accordance with requirements of Section 013300 "Submittal Procedures."

1.6 KEY PERSONNEL

- A. Key Personnel Names: Within fifteen (15) days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.7 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Architect.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: AIA Document G716 or comparable form.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven (7) working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or inaccurately prepared RFIs.
2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within ten (10) days of receipt of the RFI response.
- E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven (7) days if Contractor disagrees with response.
- F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
 1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number including RFIs that were dropped and not submitted.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.
 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.8 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: General Contractor or Construction Manager is responsible for recording significant discussions and agreements achieved. General Contractor or Construction Manager is also responsible for distributing the meeting minutes to everyone concerned including Owner and Architect, within three (3) days of the meeting.

- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than fifteen (15) days after execution of the Agreement.
1. Conduct the conference to review responsibilities and personnel assignments.
 2. Attendees: Authorized representatives of Owner, Construction Administrator, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Lines of communications.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for RFIs.
 - h. Procedures for testing and inspecting.
 - i. Procedures for processing Applications for Payment.
 - j. Distribution of the Contract Documents.
 - k. Submittal procedures.
 - l. Preparation of record documents.
 - m. Work restrictions.
 - n. Working hours.
 - o. Owner's occupancy requirements.
 - p. Responsibility for temporary facilities and controls.
 - q. Procedures for moisture and mold control.
 - r. Procedures for disruptions and shutdowns.
 - s. Parking availability.
 - t. Office, work, and storage areas.
 - u. Equipment deliveries and priorities.
 - v. First aid.
 - w. Security.
 - x. Progress cleaning.
 4. Minutes: General Contractor or Construction Manager is responsible for recording and distributing meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives 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 Architect of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.

- c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility problems.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written recommendations.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a Project closeout conference, at a time convenient to Owner and Architect, but no later than thirty (30) days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for preparing operations and maintenance data.
 - e. Requirements for demonstration and training.

- f. Preparation of Contractor's punch list.
 - g. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - h. Submittal procedures.
 - i. Installation of Owner's fixtures.
 - j. Responsibility for removing temporary facilities and controls.
4. Minutes: General Contractor or Construction Manager is responsible for recording and distributing meeting minutes.
- E. Progress Meetings: Conduct progress meetings at biweekly intervals.
- 1. Coordinate dates of meetings with preparation of payment requests.
 - 2. Attendees: In addition to representatives of Owner and Architect, each Contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of proposal requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.

4. Minutes: General Contractor or Construction Manager is responsible for recording and distributing meeting minutes.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

- F. Coordination Meetings: Conduct Project coordination meetings at required intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
 1. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.

 2. Reporting: General Contractor or Construction Manager is responsible for recording meeting results and distributing copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

- 1. Contractor's construction schedule.
- 2. Daily construction reports.
- 3. Material location reports.
- 4. Field condition reports.
- 5. Special reports.

- B. Related Sections:

- 1. Section 013300 "Submittal Procedures" for submitting schedules and reports.
- 2. Section 014000 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

- 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
- 2. Predecessor Activity: An activity that precedes another activity in the network.
- 3. Successor Activity: An activity that follows another activity in the network.

- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.

- C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

- D. Event: The starting or ending point of an activity.

- E. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

- F. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:

1. PDF electronic file.

- B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

- C. Daily Construction Reports: Submit at weekly intervals.

- D. Material Location Reports: Submit at weekly intervals.

- E. Field Condition Reports: Submit at time of discovery of differing conditions.

- F. Special Reports: Submit at time of unusual event.

1.5 QUALITY ASSURANCE

- A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the Contractor's construction schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Discuss constraints, including phasing, work stages and area separations.
3. Review delivery dates for Owner-furnished products.
4. Review schedule for work of Owner's separate contracts.
5. Review time required for review of submittals and resubmittals.
6. Review requirements for tests and inspections by independent testing and inspecting agencies.
7. Review time required for completion and startup procedures.
8. Review and finalize list of construction activities to be included in schedule.
9. Review submittal requirements and procedures.
10. Review procedures for updating schedule.

1.6 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than twenty (20) days, unless specifically allowed by Architect.
 - 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than sixty (60) days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 - 4. Startup and Testing Time: Include not less than fifteen (15) days for startup and testing.
 - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
 - 6. Punch List and Final Completion: Include not more than thirty (30) days for punch list and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.
 - 1. Phasing: Arrange list of activities on schedule by phase.
 - 2. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.

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- b. Uninterruptible services.
 - c. Use of premises restrictions.
 - d. Provisions for future construction.
 - e. Seasonal variations.
 - f. Environmental control.
3. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
- a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Startup and placement into final use and operation.
4. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
- a. Completion of mechanical installation.
 - b. Completion of electrical installation.
 - c. Substantial Completion.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
- E. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.
- 1. Refer to Section 012900 "Payment Procedures" for cost reporting and payment procedures.
- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
- 1. Unresolved issues.
 - 2. Unanswered RFIs.
 - 3. Rejected or unreturned submittals.
 - 4. Notations on returned submittals.
- G. Recovery Schedule: When periodic update indicates the Work is fourteen (14) or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to

working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

- H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's construction schedule within seven (7) days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 - 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in ten percent (10%) increments within time bar.

2.3 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 - 1. List of subcontractors at Project site.
 - 2. List of separate contractors at Project site.
 - 3. Approximate count of personnel at Project site.
 - 4. Equipment at Project site.
 - 5. Material deliveries.
 - 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 - 7. Accidents.
 - 8. Meetings and significant decisions.
 - 9. Unusual events (refer to special reports).
 - 10. Stoppages, delays, shortages, and losses.
 - 11. Meter readings and similar recordings.
 - 12. Emergency procedures.
 - 13. Orders and requests of authorities having jurisdiction.
 - 14. Change Orders received and implemented.
 - 15. Construction Change Directives received and implemented.
 - 16. Services connected and disconnected.
 - 17. Equipment or system tests and startups.
 - 18. Partial completions and occupancies.
 - 19. Substantial Completions authorized.
- B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

- C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.4 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one (1) day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one (1) week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate final completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect, Construction Administrator, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Periodic construction photographs.
- B. Related Sections:
 - 1. Section 013300 "Submittal Procedures" for submitting photographic documentation.
 - 2. Section 017700 "Closeout Procedures" for submitting photographic documentation as project record documents at Project closeout.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of eight (8) megapixels, and at an image resolution of not less than 1600 by 1200 pixels and 400 dpi.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

- A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - 1. Date and Time: Include date and time in file name for each image.
 - 2. Field Office Images: Maintain one (1) set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.

- C. Periodic Construction Photographs: Take eighteen to twenty (18-20) photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

- D. Additional Photographs: Architect may request photographs in addition to periodic photographs specified.
 - 1. In emergency situations, take additional photographs within 24 hours of request.
 - 2. Circumstances that could require additional photographs include, but are not limited to, the following:
 - a. Immediate follow-up when on-site events result in construction damage or losses.
 - b. Substantial Completion of a major phase or component of the Work.

END OF SECTION 013233

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

- B. Related Sections:

1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
4. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as action submittals.
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as informational submittals.
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making

corrections or modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Submit concurrently with Contractor's construction schedule. Include submittals required during the first sixty (60) days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal Category: Action, informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's final release or approval.
 - g. Scheduled dates for purchasing.
 - h. Scheduled dates for installation.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic copies of the CAD Drawings of the Contract Drawings will **not** be provided by Architect for Vendor's use in preparing submittals unless requested and Architect's user agreement properly completed.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 1. Initial Review: Allow ten (10) days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.

2. Resubmittal Review: Allow ten (10) days for review of each resubmittal.
 3. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow fifteen (15) days for initial review of each submittal.
- D. Identification and Information: Place a permanent label or title block on each paper copy submittal item for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Name of subcontractor.
 - f. Name of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Other necessary identification.
- E. Identification and Information: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
 4. Include the following information on an inserted cover sheet:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.

- d. Name of Contractor.
 - e. Name of firm or entity that prepared submittal.
 - f. Name of subcontractor.
 - g. Name of supplier.
 - h. Name of manufacturer.
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Related physical samples submitted directly.
 - m. Other necessary identification.
5. Include the following information as keywords in the electronic file metadata:
- a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.
- F. Options: Identify options requiring selection by the Architect.
- G. Deviations: Identify deviations from the Contract Documents on submittals.
- H. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
- I. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review received from sources other than Contractor.
1. Transmittal Form: Provide locations on form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Specification Section number and title.
 - i. Indication of full or partial submittal.
 - j. Drawing number and detail references, as appropriate.
 - k. Transmittal number, numbered consecutively.
 - l. Submittal and transmittal distribution record.
 - m. Remarks.
 - n. Signature of transmitter.
 2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents,

including minor variations and limitations. Include same identification information as related submittal.

- J. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- K. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- L. Use for Construction: Use only final submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Submit electronic submittals via email as PDF electronic files.
 - a. Architect will return annotated file. Annotate and retain one (1) copy of file as an electronic Project record document file.
 - 2. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
 - 3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
 - 4. Test and Inspection Reports Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8½ by 11 inches but no larger than 30 by 42 inches.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one (1) submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.

- c. Sample source.
 - d. Number and title of applicable Specification Section.
- 3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 - 1. Type of product. Include unique identifier for each product indicated in the Contract Documents.
 - 2. Manufacturer and product name, and model number if applicable.
 - 3. Number and name of room or space.
 - 4. Location within room or space.
- F. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- G. Application for Payment: Comply with requirements specified in Section 012900 "Payment Procedures."
- H. Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."
- I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- J. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Architects and Owners, and other information specified.
- K. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.

- L. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- M. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- N. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- O. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- P. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- Q. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- R. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- S. Schedule of Tests and Inspections: Comply with requirements specified in Section 014000 "Quality Requirements."
- T. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- U. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- V. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

- W. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- E. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections:
 - 1. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances.

Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

- D. Preconstruction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- E. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Tests: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.
- G. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: 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.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.
- J. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five (5) previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 DELEGATED-DESIGN SERVICES

- 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 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two (2) or more standards or requirements are specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for direction before proceeding.

- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.6 ACTION SUBMITTALS

- A. Shop Drawings: For mockups.
 - 1. Include plans, sections, and elevations, indicating materials and size of mockup construction.
 - 2. Indicate manufacturer and model number of individual components.
 - 3. Provide axonometric drawings for conditions difficult to illustrate in two (2) dimensions.
- B. Delegated-Design Services Submittal: 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.

1.7 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems.
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
 - 2. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.
- D. Testing Agency Qualifications: 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.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.

7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

- F. Reports: Prepare and submit certified written reports and documents as specified.
- G. Permits, Licenses, and Certificates: For Owner's record, 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.

1.8 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within ten (10) days of Notice to Proceed, and not less than five (5) days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: Include in quality-control plan a comprehensive schedule of Work requiring testing or inspection, including the following:
1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
 2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
 3. Owner-performed tests and inspections indicated in the Contract Documents.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.9 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.

1.10 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

- B. **Manufacturer Qualifications:** A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. **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.
- D. **Installer Qualifications:** A firm or individual experienced in installing, erecting, applying, 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.
- E. **Professional Engineer Qualifications:** A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. **Specialists:** Certain Specification Sections 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. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. **Testing Agency Qualifications:** An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
- H. **Manufacturer's Technical Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. **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.
- J. **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. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at the Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven (7) days for initial review and each re-review of each mockup.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed, unless otherwise indicated.

1.11 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
 3. Costs for testing that is cancelled will be charged to the Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify that the Work complies with requirements.
 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

- D. **Manufacturer's Technical Services:** Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. **Retesting/Reinspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- F. **Testing Agency Responsibilities:** Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 - 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 - 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 - 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 - 6. Do not perform any duties of Contractor.
- G. **Associated Contractor Services:** Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
 - 4. Facilities for storage and field curing of test samples.
 - 5. Delivery of samples to testing agencies.
 - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 - 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. **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.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. **Schedule of Tests and Inspections:** Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. 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.

1.12 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:
 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect, Contractor and to authorities having jurisdiction.
 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
 1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Architect.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.
 1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.

- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

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 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": 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.

1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.
- C. Copies of Standards: Each entity engaged in construction on Project should 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.

1.4 ABBREVIATIONS AND ACRONYMS

- A. 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's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ABMA - American Boiler Manufacturers Association; www.abma.com.
8. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
11. AF&PA - American Forest & Paper Association; www.afandpa.org.
12. AGA - American Gas Association; www.aga.org.
13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
15. AI - Asphalt Institute; www.asphaltinstitute.org.
16. AIA - American Institute of Architects (The); www.aia.org.
17. AISC - American Institute of Steel Construction; www.aisc.org.
18. AISI - American Iron and Steel Institute; www.steel.org.
19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
21. ANSI - American National Standards Institute; www.ansi.org.
22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
23. APA - APA - The Engineered Wood Association; www.apawood.org.
24. APA - Architectural Precast Association; www.archprecast.org.
25. API - American Petroleum Institute; www.api.org.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASCE - American Society of Civil Engineers; www.asce.org.
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.

32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
34. ASSP - American Society of Safety Professionals (The); www.assp.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AVIXA - Audiovisual and Integrated Experience Association; (Formerly: Infocomm International); www.soundandcommunications.com.
38. AWEA - American Wind Energy Association; www.awea.org.
39. AWI - Architectural Woodwork Institute; www.awinet.org.
40. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
41. AWWA - American Wood Protection Association; www.awpa.com.
42. AWS - American Welding Society; www.aws.org.
43. AWWA - American Water Works Association; www.awwa.org.
44. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
45. BIA - Brick Industry Association (The); www.gobrick.com.
46. BICSI - BICSI, Inc.; www.bicsi.org.
47. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
48. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
49. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
50. CDA - Copper Development Association; www.copper.org.
51. CE - Conformance Européenne; www.ec.europa.eu/growth/single-market/ce-marking.
52. CEA - Canadian Electricity Association; www.electricity.ca.
53. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
54. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
55. CGA - Compressed Gas Association; www.cganet.com.
56. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
57. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
58. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
59. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
60. CPA - Composite Panel Association; www.compositepanel.org.
61. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
62. CRRC - Cool Roof Rating Council; www.coolroofs.org.
63. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
64. CSA - CSA Group; www.csa-group.org.
65. CSI - Construction Specifications Institute (The); www.csiresources.org.
66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67. CTA - Consumer Technology Association; www.cta.tech.
68. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.coolingtechnology.org.
69. CWC - Composite Wood Council; (See CPA).
70. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
71. DHA - Decorative Hardwoods Association; (Formerly: Hardwood Plywood & Veneer Association); www.decorativehardwoods.org.
72. DHI - Door and Hardware Institute; www.dhi.org.
73. ECA - Electronic Components Association; (See ECIA).
74. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
75. ECIA - Electronic Components Industry Association; www.ecianow.org.

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76. EIA - Electronic Industries Alliance; (See TIA).
 77. EIMA - EIFS Industry Members Association; www.eima.com.
 78. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
 79. EOS/ESD Association; (Electrostatic Discharge Association); www.esda.org.
 80. ESTA - Entertainment Services and Technology Association; (See PLASA).
 81. ETL - Intertek (See Intertek); www.intertek.com.
 82. EVO - Efficiency Valuation Organization; www.evo-world.org.
 83. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
 84. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
 85. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
 86. FM Approvals - FM Approvals LLC; www.fmglobal.com.
 87. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
 88. FRSA - Florida Roofing, Sheet Metal Contractors Association, Inc.; www.floridarroof.com.
 89. FSA - Fluid Sealing Association; www.fluidsealing.com.
 90. FSC - Forest Stewardship Council U.S.; www.fscus.org.
 91. GA - Gypsum Association; www.gypsum.org.
 92. GANA - Glass Association of North America; (See NGA).
 93. GS - Green Seal; www.greenseal.org.
 94. HI - Hydraulic Institute; www.pumps.org.
 95. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
 96. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
 97. HPVA - Hardwood Plywood & Veneer Association; (See DHA).
 98. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
 99. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
 100. IAS - International Accreditation Service; www.iasonline.org.
 101. ICBO - International Conference of Building Officials; (See ICC).
 102. ICC - International Code Council; www.iccsafe.org.
 103. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
 104. ICPA - International Cast Polymer Association; www.theicpa.com.
 105. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
 106. IEC - International Electrotechnical Commission; www.iec.ch.
 107. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
 108. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
 109. IESNA - Illuminating Engineering Society of North America; (See IES).
 110. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
 111. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
 112. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.org.
 113. II - Infocomm International; (See AVIXA).
 114. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
 115. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
 116. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
 117. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
 118. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
 119. ISO - International Organization for Standardization; www.iso.org.
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120. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
 121. ITU - International Telecommunication Union; www.itu.int.
 122. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
 123. LMA - Laminating Materials Association; (See CPA).
 124. LPI - Lightning Protection Institute; www.lightning.org.
 125. MBMA - Metal Building Manufacturers Association; www.mbma.com.
 126. MCA - Metal Construction Association; www.metalconstruction.org.
 127. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
 128. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
 129. MHI - Material Handling Industry of America; www.mhia.org.
 130. MIA - Marble Institute of America; (See NSI).
 131. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
 132. MPI - Master Painters Institute; www.paintinfo.com.
 133. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
 134. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
 135. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
 136. NADCA - National Air Duct Cleaners Association; www.nadca.com.
 137. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
 138. NALP - National Association of Landscape Professionals; www.landscapeprofessionals.org.
 139. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
 140. NBI - New Buildings Institute; www.newbuildings.org.
 141. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
 142. NCMA - National Concrete Masonry Association; www.ncma.org.
 143. NEBB - National Environmental Balancing Bureau; www.nebb.org.
 144. NECA - National Electrical Contractors Association; www.necanet.org.
 145. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
 146. NEMA - National Electrical Manufacturers Association; www.nema.org.
 147. NETA - InterNational Electrical Testing Association; www.netaworld.org.
 148. NFHS - National Federation of State High School Associations; www.nfhs.org.
 149. NFPA - National Fire Protection Association; www.nfpa.org.
 150. NFPA - NFPA International; (See NFPA).
 151. NFRC - National Fenestration Rating Council; www.nfrc.org.
 152. NGA - National Glass Association (The); (Formerly: Glass Association of North America); www.glass.org.
 153. NHLA - National Hardwood Lumber Association; www.nhla.com.
 154. NLGA - National Lumber Grades Authority; www.nlga.org.
 155. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
 156. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
 157. NRCA - National Roofing Contractors Association; www.nrca.net.
 158. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
 159. NSF - NSF International; www.nsf.org.
 160. NSI - National Stone Institute; (Formerly: Marble Institute of America); www.naturalstoneinstitute.org.
 161. NSPE - National Society of Professional Engineers; www.nspe.org.
 162. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
 163. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
 164. NWFA - National Wood Flooring Association; www.nwfa.org.
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165. NWRA - National Waste & Recycling Association; www.wasterecycling.org
 166. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
 167. PDI - Plumbing & Drainage Institute; www.pdionline.org.
 168. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
 169. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
 170. RFCI - Resilient Floor Covering Institute; www.rfci.com.
 171. RIS - Redwood Inspection Service; www.redwoodinspection.com.
 172. SAE - SAE International; www.sae.org.
 173. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
 174. SDI - Steel Deck Institute; www.sdi.org.
 175. SDI - Steel Door Institute; www.steeldoor.org.
 176. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
 177. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
 178. SIA - Security Industry Association; www.siaonline.org.
 179. SJI - Steel Joist Institute; www.steeljoist.org.
 180. SMA - Screen Manufacturers Association; www.smainfo.org.
 181. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
 182. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
 183. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
 184. SPIB - Southern Pine Inspection Bureau; www.spib.org.
 185. SPRI - Single Ply Roofing Industry; www.spri.org.
 186. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
 187. SSINA - Specialty Steel Industry of North America; www.ssina.com.
 188. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
 189. STI - Steel Tank Institute; www.steeltank.com.
 190. SWI - Steel Window Institute; www.steelwindows.com.
 191. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
 192. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
 193. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
 194. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
 195. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
 196. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
 197. TMS - The Masonry Society; www.masonrysociety.org.
 198. TPI - Truss Plate Institute; www.tpinst.org.
 199. TPI - Turfgrass Producers International; www.turfgrasssod.org.
 200. TRI - Tile Roofing Institute; www.tilerroofing.org.
 201. UL - Underwriters Laboratories Inc.; www.ul.com.
 202. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
 203. USAV - USA Volleyball; www.usavolleyball.org.
 204. USGBC - U.S. Green Building Council; www.usgbc.org.
 205. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
 206. WA - Wallcoverings Association; www.wallcoverings.org.
 207. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
 208. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
 209. WDMA - Window & Door Manufacturers Association; www.wdma.com.

210. WI - Woodwork Institute; www.wicnet.org.
211. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
212. WWPA - Western Wood Products Association; <http://www.wwpa.org>.

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
2. ICC - International Code Council; www.iccsafe.org.
3. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; www.quicksearch.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov/fdsys.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeial Convention; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.govinfo.gov.
2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.

3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from DLA Document Services;
www.quicksearch.dla.mil.
 - a. Available from Defense Standardization Program; www.dsp.dla.mil.
 - b. Available from General Services Administration; www.gsa.gov.
 - c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org.
6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes requirements for temporary support, security, and protection facilities.
- B. Related Requirements:
 - 1. Section 011000 "Summary of Work" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.
- B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, tpestyles, graphic elements, and message content.

1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading, if required. Unit must be large enough for regular job meetings, plan review areas, submittal storage and other job file and administrative functions.
 - 1. If provided, Contractor will be responsible for its complete installation.
 - 2. No building space will be provided by the Owner for the Contractor's field office.
- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Sheds to be metal box storage units or have wood floors raised above the ground.
 - 2. Store combustible materials apart from building.

2.2 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- D. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

- E. Electronic Communication Service: Regardless of availability of Owner's service, the Contractor shall maintain at his expense secure and reliable WiFi wireless connection to internet with provisions for access by Architect, the Owner's staff, Municipal Officials or Inspectors, and all subcontractors.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 - 1. Provide construction for temporary sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
 - 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- C. Parking: Provide temporary parking areas for construction personnel.
- D. Project Signs: Provide Project signs as required by Owner. Unauthorized signs are not permitted.
 - 1. Identification Signs: Provide Project identification signs.
 - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 - 3. Maintain and touch up signs so they are legible at all times.
- E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
 - 1. The Contractor shall locate and mark the exact locations of the utilities or services and adequately protect them from damage during the work. In the event that any are accidentally disturbed, the Contractor shall repair or replace such damage immediately and restore service as promptly as possible.

- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- D. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- E. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- B. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 - 2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Sections:
 - 1. Section 012500 "Substitution Procedures" for requests for substitutions.
 - 2. Section 014200 "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one (1) week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
 - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two (2) or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
 1. Store products to allow for inspection and measurement of quantity or counting of units.
 2. Store materials in a manner that will not endanger Project structure.
 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.

4. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
5. Protect stored products from damage and liquids from freezing.
6. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 3. Refer to Divisions 02 through 49. Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one (1) of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered, unless otherwise indicated.
 - b. Non-Restricted List: Where Specifications include a list of names of both available manufacturers and products, provide one (1) of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
4. Manufacturers:
 - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one (1) of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered, unless otherwise indicated.
 - b. Non-Restricted List: Where Specifications include a list of available manufacturers, provide a product by one (1) of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one (1) of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one (1) of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with

requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed, SIDE-BY-SIDE comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Installation of the Work.
2. Cutting and patching.
3. Progress cleaning.
4. Starting and adjusting.
5. Protection of installed construction.
6. Correction of the Work.

- B. Related Sections:

1. Section 013300 "Submittal Procedures" for submitting surveys.
2. Section 017700 "Closeout Procedures" for recording of Owner-accepted deviations from indicated lines and levels and final cleaning.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

- A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.5 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from the Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. 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.
 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their 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.
 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction 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.
- B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.

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- d. Recommended corrections.
 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.
- 3.2 PREPARATION
- A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
 - C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."
- 3.3 INSTALLATION
- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.
 - B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
 - C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
 - D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
 - E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

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- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
 - G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
 - H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
 - I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Temporary Support: Provide temporary support of work to be cut.
- C. Protection: Protect in-place 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.
- D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching.
- E. Existing Utility Services: Where existing services are required to be removed, relocated, or abandoned, bypass such systems before cutting to minimize interruption to occupied areas.
- F. Cutting: Cut in-place 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.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 5. Proceed with patching after construction operations requiring cutting are complete.
- G. 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 practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place 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, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.5 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

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1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven (7) days during normal weather or three (3) days if the temperature is expected to rise above 80 deg F (27 deg C).
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Utilize containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where more than one installer has worked.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.
- 3.6 STARTING AND ADJUSTING
- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.7 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.8 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

- 1. Substantial Completion procedures.
- 2. Final completion procedures.
- 3. Warranties.

- B. Related Sections:

- 1. Section 017300 "Execution" for progress cleaning of Project site.
- 2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
- 3. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
- 4. Section 017900 "Demonstration and Training" for requirements for instructing Owner's personnel.
- 5. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with 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 photographic documentation, damage or settlement surveys, property 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 touchup 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 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.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures".
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.
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.
5. Secure and provide both temporary and final Certificate of Occupancy from the Building Official, meeting all local and state permit closeout requirements.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect 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.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use **CSI Form 14.1A** or comparable form.
1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 2. Organize items applying to each space by major element, including categories for ceiling, 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.
 - d. Name of Contractor.
 - e. Page number.
 4. Submit list of incomplete items in the following format:
 - a. PDF electronic file. Architect will return annotated file.

1.6 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. Partial Occupancy: Submit properly executed warranties within fifteen (15) days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. 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, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8½-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. Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION (Not Used)

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

- 1. Operation and maintenance documentation directory.
- 2. Emergency manuals.
- 3. Systems and equipment operation manuals.
- 4. Systems and equipment maintenance manuals.
- 5. Product maintenance manuals.

- B. Related Sections:

- 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
- 2. Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual specification sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

- 1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
- 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

- B. Format: Submit operations and maintenance manuals in the following format:

- 1. Two (2) thumb drives. Enable review comments on draft submittals.

2. Two (2) paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return both copies to be given to the Owner.
- C. Initial Manual Submittal: Submit draft copy of each manual at least thirty (30) days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least fifteen (15) days before commencing demonstration and training. Architect will return copy with comments.
 1. Correct or modify each manual to comply with Architect's comments. Submit copies of each corrected manual within fifteen (15) days of receipt of Architect's comments and prior to commencing demonstration and training.
- E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- B. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
 1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8½-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two (2) or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
4. Supplementary Text: Prepared on 8½-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 1. Title page.
 2. Table of contents.
 3. Manual contents.
- B. Title Page: Include the following information:
 1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name and contact information for Contractor.
 6. Name and contact information for Architect.
 7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 8. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 1. If operation or maintenance documentation requires more than one (1) volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one (1) system into a single binder.

1.7 EMERGENCY MANUALS

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Content: Organize manual into a separate section for each of the following:
 - 1. Type of emergency.
 - 2. Emergency instructions.
 - 3. Emergency procedures.
- C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 - 1. Fire.
 - 2. Flood.
 - 3. Gas leak.
 - 4. Water leak.
 - 5. Power failure.
 - 6. Water outage.
 - 7. System, subsystem, or equipment failure.
 - 8. Chemical release or spill.
- D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- E. Emergency Procedures: Include the following, as applicable:
 - 1. Instructions on stopping.
 - 2. Shutdown instructions for each type of emergency.
 - 3. Operating instructions for conditions outside normal operating limits.
 - 4. Required sequences for electric or electronic systems.
 - 5. Special operating instructions and procedures.

1.8 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

1.9 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional
- B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one (1) item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.
- F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

- G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.
- J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of maintenance manuals.

1.10 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
- E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.

- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.
- B. Related Sections:
 - 1. Section 017700 "Closeout Procedures" for general closeout procedures.
 - 2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Divisions 02 through 49 Sections for specific requirements for project record documents of the Work in those Sections.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one (1) set(s) of marked-up record prints.
- B. Record Specifications: Submit one (1) paper copy of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one (1) paper copy of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one (1) set of marked-up paper copies of the Contract Drawings and Shop Drawings.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding archive photographic documentation.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Locations and depths of underground utilities.
 - d. Revisions to routing of piping and conduits.
 - e. Revisions to electrical circuitry.
 - f. Actual equipment locations.
 - g. Duct size and routing.
 - h. Locations of concealed internal utilities.
 - i. Changes made by Change Order or Construction Change Directive.
 - j. Changes made following Architect's written orders.
 - k. Details not on the original Contract Drawings.
 - l. Field records for variable and concealed conditions.
 - m. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Paper copy.
 3. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."

- d. Name of Architect.
- e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 - 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 - 4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
 - 5. Note related Change Orders, record Product Data, and record Drawings where applicable.
- B. Format: Submit record Specifications as paper copy.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 - 3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- B. Format: Submit record Product Data as paper copy.
 - 1. Include record Product Data directory organized by specification section number and title, electronically linked to each item of record Product Data.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one (1) copy of each submittal during the construction period for project record document purposes. Post changes and modifications to project record documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

- 1. Demonstration of operation of systems, subsystems, and equipment.
- 2. Training in operation and maintenance of systems, subsystems, and equipment.

- B. Related Sections:

- 1. Divisions 02 through 49 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

- 1. Indicate proposed training modules utilizing manufacturer-produced demonstration for systems, equipment, and products in lieu of video recording of live instructional module.

- B. Attendance Record: For each training module, submit list of participants and length of instruction time.

- C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

- C. Pre-Instruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 - 3. Review required content of instruction.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.

- b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
- a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
- a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
- a. Diagnostic instructions.
 - b. Test and inspection procedures.
7. Maintenance: Include the following:
- a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.

- f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
8. Repairs: Include the following:
- a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operations and Maintenance Data."
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 - 2. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner with at least seven (7) days advance notice.
- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test and ask Owner to sign-off on for acceptance.
- E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 017900

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BATHROOM RENOVATION PROJECT**

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PART 1 - BACKGROUND INFORMATION

1.1 REASON FOR THE WORK:

- A. The asbestos abatement at this facility is being done to accommodate the planned renovation. The scope of the renovations involves:
 - 1. Our scope was based on discussions with Ryan Haley of Silver Petrucelli, and review of Silver Petrucelli + Associates renovation plans dated 3/14/2022.

1.2 BUILDING DESCRIPTION:

- A. The Doolittle Elementary School is a one-story building with a total area of about 47,720 sq ft constructed of steel and masonry. Heat from the boilers is distributed through pipe chases up to heat units in rooms. There is a duct system above the drop ceilings throughout the building. The original building was constructed in 1962, totaling about 41,295 sq ft. In 1979 there was a 6,425 sq ft addition put on. In 1965 and 1975 there were 3 portable buildings added. There were major renovations in 1994 and 1995. The portable classrooms were eliminated. New additions were installed in 1995.

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PART 2 - ASBESTOS SCOPE OF WORK

2.1 BASIC SERVICES:

- A. Asbestos work areas are listed in Schedule 1.
- B. Contractor is responsible for proper disposal of all ACM wastes.
- C. Quantities given either in this specification or in the attached Pre-Renovation Inspection report (Appendix A) are estimated; The Asbestos Abatement Contractor is responsible for accepting the quantities or measuring them to His satisfaction. The Asbestos Abatement Contractor shall have no claim as to added work as the result of accepting said measurements or other stated conditions. The Asbestos Abatement Contractor shall report any discrepancies to the Owner and to Chem Scope, Inc. or accept the amounts or quantities to be correct as herein stated.
- D. All replacement materials will be put in by others. Only non-asbestos replacement materials can be used.
- E. Refer to drawings appended where work locations are shown schematically.
- F. In the event of disagreement between drawings and the specification, the specification shall take precedence.
- G. The Work of this Contract is to be done in accordance with applicable regulations and these specifications. Where specifications and regulations disagree, the strictest requirements shall be observed.

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2.2 DETAILED SCOPE OF WORK:

- A. The asbestos abatement contractor shall refer to the Asbestos Pre-Renovation Inspection Report in Appendix A of these Specifications and the instructions to follow.
- B. This Section specifies the requirements for the removal of ACM at the Work Site. The Work includes, but may not be limited to, removal and disposal of the following ACM from Doolittle Elementary School – First Floor – Room 14 Bathroom and Room 15 Bathroom including all selective demolition and dismantling needed to perform the work, as delineated in Schedule 1. The quantities of ACM listed below are approximate.

1. First Floor – Room 14 Bathroom and Room 15 Bathroom (Interior):

- a) Remove all (approximately 10 square feet) of pipe fitting insulation assumed to be on fiberglass insulated metal pipes inside walls as delineated in Schedule 1 (must pass CT DPH “no visible residue criteria”). The areas are shown schematically in the attached drawings. All pipe insulation is to be packaged and disposed of properly as ACM waste.

2. First Floor – Room 14 Bathroom and Room 15 Bathroom (Interior):

- a) Remove all (approximately 14 square feet) of sheetrock walls with ACM taping compound as delineated in Schedule 1 (must pass CT DPH “no visible residue criteria”). The areas are shown schematically in the attached drawings. All sheetrock walls are to be packaged and disposed of properly as ACM waste.

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2.3 SCHEDULE 1:

<i>MATERIAL</i>	<i>LOCATION</i>	<i>~FOOTAGE</i>
<u>Interior – First Floor:</u>		
White/beige thin/brittle ACM taping compound painted tan *on grey crumbly sheetrock with brown fibrous paper backing (from wall)	First Floor – Room 14 Bath First Floor - Room 15 Bath	7 SF each
		<u>Total: 14 SF</u>
Gray fibrous powdery ACM pipe fittings from fiberglass insulated metal pipes assumed to be behind cinderblock walls	First Floor – Room 14 Bath,	10 SF
Gray fibrous powdery ACM pipe fittings from fiberglass insulated metal pipes assumed to be behind cinderblock walls	First Floor – Room 15 Bath,	10 SF
		<u>Total: 20 SF</u>

*Because the material attached to this material contains asbestos, this material will need to be treated as an asbestos containing material (ACM).

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PART 3 - ADDITIONAL DETAILS OF EXECUTION OF WORK

3.1 GENERAL INSTRUCTIONS:

Work will be executed according to the preceding instructions in the general section of this Specification except as modified by instructions under this section as follows:

- A. Project Monitor Services will be provided by Owner. Final clearance testing and monitoring shall be performed by the Project Monitor (PM). Cooperate with Owner and testing laboratory in scheduling and obtaining samples.
- B. Pre-existing damage to any equipment, fixture or surface in the area must be documented with narrative and photographs before the work by the Asbestos Abatement Contractor and verified by the Project Monitor during the week before project start. A report of pre-existing damage, signed by the Project Monitor, must be e-mailed and mailed to the owner before project start up. Otherwise, Contractor will be held responsible.
- C. The Asbestos Abatement Contractor is to provide means of reaching high work such as lifts, scaffolding, ladders, and the like.
- D. The use of combustion engine driven equipment inside the building is prohibited, unless used with additional engineering controls such as a catalytic converter and carbon monoxide monitoring. Any needed carbon monoxide monitoring shall be provided by the Asbestos Abatement Contractor.
- E. The owner will supply water at taps that the Asbestos Abatement Contractor can modify for use and return to original function when the project is completed.
- F. The Asbestos Abatement Contractor will be responsible for providing temporary power as needed. Owner will supply necessary power at reasonable locations.
- G. Any temporary lighting will be supplied by the Asbestos Abatement Contractor. Fixtures should be floor-mounted or otherwise strategically located so that they are out of the way of the work and provide adequate lighting in accordance with OSHA requirements.
- H. The Contractor is to supply adequate toilet facilities, in accordance with 29 CFR 1926.51(c), for the duration of this project, if none of the site's facilities are available for their use.
- I. Protect all surfaces and equipment against damage. The Asbestos Abatement Contractor shall be responsible for repairing any damage or marring caused to surfaces or equipment except surfaces to be abated. Clean all marks from surfaces left by glue, duct tape or otherwise restore and refinish, if necessary to restore surfaces. Repair any surface damage to match existing finishes.
- J. Movable objects including furniture and stored material will be removed from the work areas by the Owner before the work and returned by the owner after the work.

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3.1 GENERAL INSTRUCTIONS (CONT):

- K. Perform related work to access the asbestos materials to be removed including any necessary demolition.
- L. Asbestos Abatement Contractor is responsible for proper disposal of all wastes.
- M. The replacement materials will be the responsibility of the owner and done by others. Contractors shall provide SDS for all the materials installed. **Use only Asbestos-free replacement materials.**
- N. The contractor is required to prepare a Job Hazards Analysis (JHA) and logistics plan for this scope of work. The JHA must address, for example: Site Safety Rules, as well as the scope of work, emergency response (EMS for worker, breach in containment, etc). The logistics plan must address location and arrangement of decontamination system (including change area), negative air handling equipment and discharge points, temp electric power cord locations, temporary electric panels, fire extinguishers, location of pressure differential recorder(s), change area (lockers shall be provided for workers), break area and water location.
- O. All workers shall have an OSHA 10-hour card. The contractor's supervisor shall have OSHA 30-hour card. At least one supervisor shall be onsite at all times.
- P. The contractor shall develop a noise mitigation plan. Noise shall not adversely impact upon the occupied use of the owner's facility.
- Q. If at any time the Project Monitor receives analysis results of air samples run outside of the work area which exceed 0.010 f/cc by PCM (NIOSH 7400 or OSHA ORM), the Project Monitor will immediately notify the owner and general contractor. The general contractor shall develop an interim safety plan for shutdown of possibly contaminated occupied areas.

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PART 4- DIVISION 1 – ASBESTOS ABATEMENT

4.1 REGULATIONS:

- A. The Asbestos Abatement Contractor will conform to all applicable Federal State and Local Regulations, including, but not limited to the following principal regulations:
1. OSHA 29 CFR 1926.1101 (Asbestos);
 2. NESHAP (National Emissions Standards for Hazardous Air Pollutants) 40 CFR Part 61 Subpart M. (40 CFR 61.145 and 61.150)
 3. Regulation of Connecticut State of Agencies Sections 19a-332-1 through 19a-332-16 inclusive. (Standards for Asbestos Abatement)
 4. Regulation of Connecticut State of Agencies Sections 19a-333-1-13 inclusive. (Asbestos-Containing Materials in Schools)
 5. AHERA (Asbestos Hazard Emergency Response Act) 40 CFR Part 763.
 4. Regulation of Connecticut State of Agencies Sections 20-440-1 through 20-440-9 inclusive. (Licensure and Training Requirements for Asbestos Abatement).
 5. Connecticut DEEP Regulations (Section 22a-208(x) and Section 22a-252 of the Connecticut General Statutes). (DEEP Applies to Waste Disposal in CT)
 6. Principal related OSHA regulations in 29 CFR:
 - a. 1910.134 (Respirators)
 - b. 1910.38, 1926.24 and 1926.150-155 (Fire safety and emergency response)
 - c. 1926.450 et seq (Ladder and Scaffold safety)
 - d. 1926.500 (Fall Protection)
 - d. 1926.402 and .416-.417 (Electrical safety)
 - e. Additional Regulations re: Protective Clothing and Equipment:
 - 1910.132-3 Protective Clothing
 - 1910.136 Foot protection
 - 1910.137 Electrical protective devices
 - 1910.94 ventilation
 - 1910.119 process safety
 - 1910.134 respirators
 - 1910.preface 179.220-227 PPE program
 - 1910.146 permit required spaces
 - 1910.156 fire brigades
 - 1910.160 fire extinguishers
 - 1910.335 energized plugs and receptacles
 - 1910.1000 air contaminants
 - 1926.28 PPE
 - f. 1926.22 (Recording and Reporting of Injuries)
 - g. 1926.23 (First Aid and Medical Attention)
 - h. 1910.141 (Shower and Sanitation requirements)
 - i. 1926.59 (Hazard Communication)
 7. CFR 49 parts 171-173 US Dept of Transportation.
 8. U.S. Department of Transportation, Title 49, Parts 172 and 173.
 9. All State, County, Department, Municipal codes, and ordinances as applicable.

Note: Where applicable State, Federal and Local Regulations differ, the more stringent regulation applies. In the event of disagreement between these specifications and the regulations, the stricter provision shall apply.

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4.2 AIR MONITORING

A. General

1. The Owner will provide a DPH Licensed Project Monitor, (PM) to carry out the Industrial Hygiene and Air Monitoring services, which will include final clearance testing. Additional monitoring during the work will be done if requested by the owner.
2. Coordination between the Asbestos Abatement Contractor and PM.
 - a. The Asbestos Abatement Contractor will provide the PM with a schedule of work indicating the planned dates and hours of the Asbestos Abatement Contractor's work at the site.
 - b. The PM must have Reasonable Notice of any changes in this schedule.
 - c. In no case may the Asbestos Abatement Contractor be working at the site at times unknown to the PM.
 - d. Reasonable Notice shall be given by the Asbestos Abatement Contractor to the PM indicating when a work area will be ready for Pre-abatement or final clearance testing.

B. Pre-Abatement Air Sampling (Not required, only if requested by the owner):

1. Pre-Abatement air samples will be collected (if requested by the owner) at strategic locations inside and outside the planned Work Area to establish prevalent ambient air concentrations under normal building activity before the Abatement Work begins.

C. During Abatement Monitoring and/or Area Air Sampling (Not required, only if requested by the owner):

1. Daily samples will be collected (if requested by the owner) which are representative of the air outside each Decontamination Enclosure System (Decon), and representative Negative Air Unit exhaust. Sampling will be also done where feasible in the other critical barrier areas or other spaces outside the Work Area in locations determined by the PM.
2. OSHA 1926.1101(g)(4)(ii) requires for “all Class I jobs involving the **removal of more than 25 linear or 10 square feet of thermal system insulation or surfacing material**; for all other Class I jobs, where the employer cannot produce a negative exposure assessment pursuant to paragraph (f)(2)(iii) of this section, **or where employees are working in areas adjacent to the regulated area, while the Class I work is being performed**, the employer shall use one of the following methods to ensure that airborne asbestos does not migrate from the regulated area:
 - a. Critical barriers shall be placed over all the openings to the regulated area, except where activities are performed outdoors; **or**

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- b. The employer shall use another barrier or isolation method which prevents the migration of airborne asbestos from the regulated area, as verified by perimeter area surveillance during each work shift at each boundary of the regulated area, showing no visible asbestos dust; and perimeter area monitoring showing that clearance levels contained in 40 CFR Part 763, Subpart. E, of the EPA Asbestos in Schools Rule are met, or that perimeter area levels, measured by Phase Contrast Microscopy (PCM) are no more than background levels representing the same area before the asbestos work began. The results of such monitoring shall be made known to the employer no later than 24 hours from the end of the work shift represented by such monitoring.”
- D. Post Abatement Testing:
- 1. After completion of Removal in a Work Area, the PM will perform a visual inspection to ensure that no visible residue remains.
 - 2. Any final air samples will be collected aggressively, and analysis conducted by TEM or PCM as specified in the regulations.
- E. Lab Qualifications:
- 1. Analysis of the air samples by NIOSH 7400 will be made by a laboratory Accredited by AIHA (American Industrial Hygiene Association) and a board-certified analyst in the AIHA AAR program. The Laboratory must be a State Approved Environmental Laboratory (approved by Connecticut Department of Public Health Laboratory Division) for Asbestos analysis in air and must participate in and be proficient in the NIOSH PAT Program for Asbestos.
 - 2. Analysis of TEM samples will be made by a NIST/NVLAP Accredited Lab for TEM analysis. (National Institute of Standards and Technology/National Voluntary Laboratory Accreditation Program)
 - 3. Air sample analysis by PCM (NIOSH 7400 or OSHA ORM) must be conducted by individuals trained in the National Institute for Occupational Health (NIOSH) course # 582, Sampling and Analysis of Airborne Asbestos Fibers and/or equivalent course.
- F. Asbestos Abatement Contractor's Personal Air Samples: Personal air sampling shall be conducted by the Asbestos Abatement Contractor according to 1926.1101. Provide a State of Connecticut DPH (Department of Public Health) licensed Project Monitor for this purpose. Samples will include daily 30-minute excursion limit samples and 8-hour time-weighted average concentration samples. Personal air sampling results must be recorded at the work site within 24 hours and be available for review until the job is complete. Air Monitoring must be supervised by a Licensed Project Monitor. **A copy of the results shall be provided to the general contractor.**

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4.3 CRITERIA FOR TEMPORARY SUSPENSION OF ABATEMENT

A. Work Practices

1. The following actions are the basis for temporary work suspension:

- a. Work practices which are not in accordance with prescribed governmental standards and guidelines and those included in this work practices and procedures document.
- b. Work practices not specifically prohibited by regulation or by this document, but which are judged to be unsafe by the Owner. The Owner reserves the right to restrict from this project any of Contractor's employees that fail to observe good work practices or violate any rules of conduct.

B. Airborne Fiber Concentrations

1. Airborne fiber concentrations shall be considered elevated when analytical results of samples collected at locations outside of the designated work area equal or exceed 0.010 fibers (longer than 5 microns) per cubic centimeter of air (fibers/cc) as determined by the phase contrast microscopy (PCM) and NIOSH Method 7400. Analytical results of air samples collected before abatement ("background" samples) also may be evaluated to determine if airborne fiber concentrations are elevated. The Owner may determine if elevated airborne fiber concentrations are the result of activities not related to the Contractor's work and, if necessary, shall permit excursions above the limit. The laboratory may use PLM Exam (Differential Counting Method as referred to in section 6.7 of OSHA ID-160) to assist in the fiber identification. The differential counting method does not count obviously non-asbestos fibers. The morphology, sign of elongation, birefringence and extinction coefficient are used to eliminate non-asbestos fibers from the PCM count using the parameters of EPA Method 600/R-93/116. Further resolution can be obtained at the owner's request by running the sample by TEM NIOSH 7402.

2. The following air sample analytical results are the basis for temporary work suspension:

- a. Elevated airborne fiber concentrations in the areas adjacent to the worksite and in areas, while not adjacent to the worksite, which may be affected by the abatement.

3. The Owner reserves the right to redefine the airborne fiber concentration limit from 0.010 fibers/cc to any limit defined by new governmental standards or guidelines that become effective during the course of this project.

4. If the project is stopped because of elevated airborne fiber concentrations, the Contractor shall be required to clean the affected area to the satisfaction of the Owner. The Contractor shall be responsible for all additional costs for cleaning and the delay in progress. The Contractor shall provide all personnel and/or equipment necessary to complete any remedial cleaning and maintain the construction schedule. Abatement shall resume when air monitoring analytical results indicate airborne fiber concentrations are no longer elevated and the cause for the elevated fiber count has been corrected by the Contractor.

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4.4 NOTIFICATIONS

- A. Connecticut DPH: Contractor will prepare and submit 10-day notification forms required by the State of Connecticut Department of Public Health for projects involving 10 linear feet or 25 square feet of asbestos containing materials. Notification 10 calendar days before the project will be sent to:

Connecticut Dept of Public Health (DPH)
410 Capitol Ave - MS # 51AIR,
P.O. Box 340308
Hartford, CT 06134
(860) 509-7367

- B. For projects involving any demolition regardless of RACM amount or renovation which may disturb more than 260 linear feet. or 160 square feet of RACM:

- 1) Prepare and submit 10- (weekday) notification forms required by the USEPA.
- 2) Submit forms to:

Asbestos Reno Demo Notification USEPA,
Region 1 5 Post Office Square
Mail Code OES05-4
Boston MA 02109-3912

- 3) Remember, for demolition, notification is required to both CT DPH and EPA, even if no asbestos is involved.
- 4) If amount of RACM changes by 20% or more, a revised notice is needed.
- 5) If start date of project changes, a revised notice is needed.

- C. The school must send a letter to the CT-DPH to inform them of the abatement and that no children/students will be in the school building or on the adjacent school grounds at the time of the abatement.

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**4.5 ASBESTOS ABATEMENT CONTRACTOR QUALIFICATIONS AND TECHNICAL SUBMITTALS,
PRE-ABATEMENT MEETING**

- A. The Asbestos Abatement Contractor Shall Submit to the Project Monitor before Work begins:
1. Copy of Asbestos Abatement license.
 2. Copies of supervisor and worker certificates for each employee, to be used for the project including DPH certifications and required training in a State of Connecticut Approved training center: 5 days for supervisors and 4 days for workers. This documentation shall include copies of initial and refresher training to date. For each worker proof of up-to-date fit testing and medical surveillance required by CFR 29 1926.1101 and 1910.134.
 3. Documentation, when rental equipment is to be used, that the owner of the equipment is aware of the intended use of the rented equipment for Asbestos Work.
 4. Project Notifications: As required by Federal, State, and local regulatory agencies together with proof of transmittal (i.e. certified mail return receipt). The Contractor shall notify the Connecticut Department of Public Health at least ten (10) days prior to the start of asbestos abatement, as required by the Regulations of Connecticut State Agencies, Sections, 19a-332a-3, if work will include any friable and/or interior asbestos abatement.

The Contractor shall also notify U. S. EPA Region 1 for renovation projects which may disturb more than 260 linear feet or 160 square feet of RACM.
 5. Copies of any alternate work practice (AWP) requests and DPH responses.
 6. Certification that HEPA vacuums, and Negative Air units conform to ANSI Z9.2-1979 and that they are in reliable working order. Certification must be within the last six months and identifiable to each piece of equipment.

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**4.5 ASBESTOS ABATEMENT CONTRACTOR QUALIFICATIONS AND TECHNICAL SUBMITTALS,
PRE-ABATEMENT MEETING (CONT)**

7. Certification that Fire safety requirements have been or will be met:
 - a. Asbestos Abatement Contractor is responsible for applicable notifications related to asbestos work to the local fire marshal and coordination with the owner, fire department, other contractors and the PM.
 - b. Emergency response plans must be determined in advance.
 - c. The Asbestos Abatement Contractor must have provided worker fire extinguisher training according to OSHA 1926.50 (a)(5).
 - d. Escape route breakthroughs and avenues of exit in the event of a fire must be visibly marked inside the containment.
 - e. Fire extinguishers must be provided inside and outside the containment.
 - f. Precautions for fire safety involving negative air machines operating 24 hours/day.

 8. SDS's: Required OSHA Hazard Communication information and training for any hazardous chemicals at this site according to CFR 29.1926.59. Include a list of all the hazardous chemicals to be brought to the site including amounts to be brought in, the intended use, and Safety Data Sheets (SDS's) for each chemical. This includes all replacement materials to be used which must be certified asbestos- free.
- B. Submit to Project Monitor During Work:**
1. Daily Employee sign in lists which must have printed and signed names.
 2. Log of access to the work area (dive sheets)
 3. Daily narrative of the job
 4. Personal air sampling records for this job.
- C. Submit within at least 30 days of the waste being received at the disposal facility and within at least 40 days of the waste being accepted by the transporter:**
1. Waste manifests, original to the Owner and a copy to the Project Monitor. The Waste Shipment Record shall specify the designated number of bags or cubic yards of asbestos waste.

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4.6 SITE CONDITION

- A. Prior to the Work, contractor shall visit the site and be fully acquainted with present and expected conditions affecting the Work, including but not limited to:
 - 1. Physical condition of the site.
 - 2. Handling and storage of tools, equipment, and materials.
 - 3. Access to water, electric power, and other variables.
 - 4. The character and quantity of all surface and subsurface obstacles to be encountered.
- B. Any existing damage: The Asbestos Abatement Contractor shall submit to Owner in writing a list of any pre-existing damaged items on building and fixture condition prior to commencement of Work. The submittal shall include a photographic record of prior damage and/or deficiencies.

4.7 SAFETY AND SECURITY

- A. Asbestos Abatement Contractor has responsibility to establish and maintain workplace safety and security in the areas of His Work. The work areas will be locked, on off-hours, when work is not being done.
- B. Asbestos Abatement Contractor will maintain at the work site daily logs of activities and the names of all persons entering the site and include with required submittals at the end of the project. The Asbestos Abatement Contractor will allow only authorized personnel into the work area.

4.8 WORKER PROTECTION TO BE PROVIDED

- A. Asbestos Abatement Contractor's workers shall be instructed on fire, electrical, and other hazards specific to this job site. Instructions will include spill response, power failure and emergency evacuation procedures. The workers will receive the required OSHA Hazard Communication information and training for any hazardous chemicals brought to this site.
- B. All persons entering the Work Area shall wear prescribed protective clothing and respirators until the Final Clearance Tests are successfully completed for each Work Area. Respiratory protection shall meet the requirements of OSHA as described in 29CFR 1910.134 and 1926.1101 for Asbestos.
- C. The Asbestos Abatement Contractor will provide appropriate respirators, disposable suits, and other safety equipment at no cost to his employees, for Asbestos and as needed for other physical and health hazards at the work site.

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4.8 WORKER PROTECTION TO BE PROVIDED (CONT)

- D. Any feasible combination of engineering controls, work practices, and personal protective equipment may be used to reduce personnel exposure to Asbestos and other hazards.
- E. The Asbestos Abatement Contractor has responsibility to always maintain His Supervisor on site. Duties of the Supervisor shall include:
 - 1. Assessments required by OSHA 1926.1101.
 - 2. Maintaining copies of Regulations including 1926.1101 and 40CFR 61 Subpart M, all records specified in the regulations and a copy of these Specifications on site.
 - 3. Posting signs and guarding the Work Area against unauthorized intrusion and ensuring all persons entering the Work Area are properly certified, trained, and equipped and that each entry is recorded in the site log.
 - 4. Providing workers with safety equipment, except any person will have his own personal, fitted respirator.
 - 5. Ensuring proper decontamination procedures such as proper use of suits and shower are followed without exception and that the shower and other safety equipment are properly functioning.
 - 6. Performing the required Exposure Assessment as delineated herein.
- F. Before leaving the Work Area each person shall: vacuum gross contamination from protective clothing, proceed to the Equipment Room and remove all clothing except respirator, and still wearing the respirator proceed naked to the shower and clean the respirator and self, using soap and water and rinse self in the shower. Dispose of the wet respirator cartridges in a receptacle for Asbestos waste.
- G. Following showering and drying off, each person shall proceed directly to the Clean (change) Room and dress in street clothes at the end of each day's work or before eating or taking a break. Otherwise, one may don disposable clothing of a different color or otherwise distinctively different, for use outside the Work Area, than suits used inside the Work Area.
- H. Require that workers NOT eat, drink, smoke, chew gum or tobacco or use toilet facilities (either existing or temporary) in the Work Area.
- I. The prescribed protective clothing, respirator use and decontamination measures in the Work Area, including all those described in this Specification and prescribed in the Regulations will remain in effect from the moment Asbestos disturbance begins until Final Clearance of each Work Area.
- J. Employers shall make available to employees, information on programs to aid workers in cessation of smoking.
- K. Employees working in contiguous areas to the Work Area must understand warning signs. Bilingual signs, pictographs or graphics may be required.

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4.9 WORK SCHEDULING, SEQUENCE AND AREA RESTORATION

- A. The following sequence shall be observed for each work area:
1. Establish the Decon.
 2. Establish Critical Barriers at the earliest possible time to protect against fiber release during setup.
 3. Perform pre-cleaning and containment construction.
 4. Perform removal and cleanup.
 5. Notify the PM upon completion of removal and clean up.
 6. Final inspection and clearance testing will then be done by the PM.
 7. Only after satisfactory final test results from the PM: Remove Critical Barriers and Negative Air Units and restore the area to a satisfactory condition.
- B. Restoring the work areas
1. Immediately following successful final clearance in each area, the Asbestos Abatement Contractor shall remove his equipment and materials from the completed section.
 2. Restore the areas to a clean and orderly condition and where applicable, re-install displaced equipment.
 3. Leave the surfaces clean and not damaged by tape or other means.
 4. Clean duct tape and adhesive from surfaces where used to construct containment.
 5. A post abatement walkthrough will be conducted by the PM and the Asbestos Abatement Contractor after the above steps to make sure that the area is clean and in good condition.

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4.10 FIRE PROTECTION AND FIRE PREVENTION

- A. Notify the local Fire Department in advance of any work performed. Notifications shall be prior to storage or installation of the Asbestos Abatement Contractor's materials on the Owner's property.
- B. Fire Protection:
 - 1. Adequate temporary fire protection shall be provided. Fire fighting equipment shall be conspicuously located and readily accessible at all times and be maintained in operating condition.
 - 2. The Asbestos Abatement Contractor shall not obstruct any emergency egress points, fire extinguishers, and / or monitors without first notifying the Fire Marshal.
 - 3. Smoking
 - a. Smoking shall be prohibited in work areas and in the vicinity of hazardous operations or materials.
 - b. Where smoking is allowed, it shall be so noted, and safe receptacles shall be provided for smoking materials.

4.11 NEIGHBORHOOD CONSIDERATIONS

- A. Work will be conducted so as to avoid disturbing the neighborhood. Asbestos Abatement Contractor will coordinate with the PM (CT-DPH Licensed Project Monitor) suitable locations for Decons, egresses, and waste storage facilities.
- B. After the Asbestos waste container is deployed, it will remain locked unless in immediate use. The Supervisor will maintain control of the key.
- C. Littering of the area is prohibited. Asbestos Abatement Contractor will provide suitable receptacles for beverage and food containers and all other such litter and ensure that no litter is generated on the premises.

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4.12 MATERIALS

- A. Deliver all materials in the original container, packages with original manufacturer's labels.
- B. Damaged or deteriorated materials shall not be used and shall be removed from the premises. Material that becomes contaminated with Asbestos shall be decontaminated or disposed of as Asbestos waste.
- C. Use plastic sheet of 6-mil thickness for all critical barriers. Use sizes to minimize the number of seams.
- D. Polyethylene bags shall be 6-mil and of sufficient size for the application.
- E. When tie wraps of plastic are used to secure waste bags, they must be at least five inches long, pointed, and looped.
- F. Tape will be used that is capable of sealing joints in adjacent plastic sheets and for attachment of plastic sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under the anticipated load and amended water usage.
- G. Surfactant (wetting agent) shall consist of 50% polyoxethylene ether and 50% polyoxyethylene ester at a concentration of one ounce to 5 gal of water or as directed by manufacturer.
- H. Use only Asbestos-free replacement materials and according to applicable fire or building codes. Replacement materials must provide equivalent or better performance than the original Asbestos materials.
- I. Signs to be posted at the Work Area shall be in sufficient quantity to post at all entries to Work Areas. Signs will comply with OSHA 1926.1101.

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4.13 TOOLS AND EQUIPMENT

- A. The Asbestos Abatement Contractor will have available spray equipment capable of mixing wetting agent with water and generating sufficient pressure and volume and having sufficient hose length to reach all areas with Asbestos.
- B. Impermeable containers are to be used to receive and retain any Asbestos-containing or contaminated materials until disposal at an acceptable disposal site. Containers shall be labeled in accordance with OSHA 1926.1101 and shall be both water and airtight.
- C. The Asbestos Abatement Contractor shall have sufficient personal Air Monitoring equipment to monitor each type of activity in each Work Area.
- D. The Asbestos Abatement Contractor shall provide suitable tools for Asbestos Removal.
- E. Asbestos Abatement Contractor shall have sufficient quantity of equipment and materials necessary for the job including protective clothing, filter cartridges, spare fitted masks for each worker, plastic sheeting, duct tape, air filters, air sample cassettes, signs, grounded power cables, GFCI units, HEPA vacuums, Negative Air Units and spare filters, ladders, sufficient Negative Air Exhaust duct to discharge filtered air outside, shower units, Decontamination Enclosures, water filtration units and all other equipment required by Regulations and by this Specification.

4.14 PREPARATION OF THE WORK AREAS

- A. Where necessary, shut down the electric power including equipment, receptacles and lighting fixtures. Coordinate any special safety requirements with the Owner, PM and general contractor, including lock-out/tag-out and isolation of electrical equipment.
- B. Provide temporary power, circuits and lighting and ensure safe installation of temporary power sources and equipment per applicable code requirements, regulations and as specified in Section 01500. Provide safety lighting and ground fault interrupter circuits (GFCI) for all power cords and electrical equipment. Only 3 prong grounded cords will be permitted.
- C. The Contractor will coordinate locations of Decontamination Unit and Negative Air Unit locations with the PM.
- D. Shut down and isolate any heating, cooling and ventilating air systems to prevent contamination to other areas of the facility. Use proper lock-out/tag-out procedures to ensure that the ducts are off prior to the start of work and that they will remain off throughout the work in that area. Seal any vents within the Work Area. Isolation will be accomplished by sealing airtight using plastic, tape and other means.

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4.14 PREPARATION OF THE WORK AREAS (CONT)

- E. Establish Critical Barriers: Seal off all openings and any penetrations into the Work Area with plastic sheeting at least 6-mil thick. Do not seal off sprinkler heads, smoke/heat detectors or other such safety equipment. Consult the Owner for advice or instructions on such items. Doorways and corridors, which will not be used for passage during the Work, must be sealed with barriers. Barriers will be constructed with floor and wall plastic overlapping so that no water will escape from the Work Area to the contiguous area.
- F. Establish Negative Air HEPA filtered air flow at the first opportunity to produce a minimum of 0.02 inches of water negative pressure in the work area relative to the non-work area and at least 4 air changes/hour unless more stringent requirements are specified in the scope of work. These values must be verified initially, daily, and recorded by the Contractor. Use additional air flow where specified herein.
- G. Pre-clean movable objects within the proposed Work Area using HEPA vacuums and/or wet cleaning methods as appropriate and remove such objects from Work Areas to a temporary location.
- H. Pre-clean fixed objects within the Work Areas using HEPA vacuums and/or Wet Cleaning methods as appropriate and enclose with a minimum of 6-mil plastic sheeting and tape.
- I. Clean the Work Area surfaces using HEPA vacuums and/or Wet Cleaning methods.
- J. Containment construction- Cover all floors surfaces not included in the asbestos abatement work with two layers of 6-mil fire retardant polyethylene sheeting. Cover all walls and other fixed items not included in the asbestos abatement work with two layers of 4-mil fire retardant polyethylene sheeting. Poly sheeting must conform to the requirements of the National Fire Protection Association Standard 701. Cover floors first so that polyethylene extends at least twelve inches up on walls, then cover walls with polyethylene sheeting to the floor thus overlapping the first layer by at least 12 inches. Stagger seams of the polyethylene. The containment must be air and watertight. Provide Airlocks at entrances to and exits from the Work Areas.
- K. Maintain emergency exits including fire exits satisfactory to fire officials.
- L. Any ceiling protrusions, ceiling panels, porous surfaces, or irregularities which may become contaminated, interfere with the Work or permit contamination beyond the confines of the Work Area must be managed to prevent contamination or release of fibers.
- M. Any barriers constructed and structural members of Decon units using framing must conform to applicable building codes. This construction must be sufficiently sturdy to resist breaching or collapsing under active work conditions. Portable or prefabricated structures with comparable strength and effectiveness may be used.
- N. In all cases, access between contaminated and uncontaminated areas must be through an Airlock. In all cases, access between any 2 rooms within the Enclosure System shall be through a Curtained Doorway.

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4.15 PREPARATION OF THE DECONTAMINATION ENCLOSURE SYSTEM (DECON)

- A. In general, the Decon unit will conform to drawings appended, and consist of 3 totally enclosed chambers contiguous to the Work Area plus a provision for managing dirty equipment as delineated below and in Section 19a-332a-6:
1. An Equipment Room with two (2) curtained doorways; one to the Work Area and one to the Airlock.
 2. A Shower Room with two curtained doorways; one to each Airlock. Plastic on Shower Room and adjoining Equipment and Clean Rooms shall be non-transparent. Showers with hot and cold water shall be provided and used at all Asbestos Removal operations. Careful attention shall be paid to the shower construction to prevent leakage of any kind. The shower will be supplied with soap, water and towels at all times. Wastes from the shower shall be filtered using best available technology prior to disposal in the drain.
 3. A Clean Room with one Curtained Doorway into the Airlock and one entrance or exit to non-contaminated areas of the building. The Clean Room shall have sufficient lockers for storage of the workers street clothes, towels and other non-contaminated items. Joint use of this space for other functions such as offices, extraneous equipment, materials or tools shall be prohibited.
 4. Equipment Decontamination Enclosure: Provide or construct an Equipment Decontamination enclosure consisting of two (2) totally enclosed chambers including:
 - a) a Washroom consisting of an Airlock with a Curtained Doorway to a designated staging area of the Work Area and a Curtained Doorway to the Holding Area.
 - b) A Holding Area constituting an Airlock with a Curtained Doorway to the Washroom and a Curtained Doorway to a designated uncontaminated area.

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4.16 SEPARATION OF WORK AREAS FROM OCCUPIED AREAS

- A. Work areas shall be separated by means of airtight barriers.
 - 1. Where doors are at the boundary, cover both sides of the door with a double layer of plastic sheet with joints staggered and sealed with tape.
 - 2. Where corridors or other open spaces are to be the boundary, build suitable building code conforming framing and apply 3/8-inch minimum thickness sheathing on work side only unless noted otherwise. Cover both sides of partition with double layer of plastic sheet with joints staggered and sealed with tape. Edges of partition at floor, walls and ceiling shall be caulked airtight.

4.17 MAINTENANCE OF ENCLOSURE SYSTEMS

- A. The Asbestos Abatement Contractor is responsible for maintaining the Enclosure in proper condition to serve the intended purpose and meeting the requirements of the Regulations and these Specifications. The Competent Person will inspect the Enclosure initially and daily:
 - 1. Visual inspection for conformity.
 - 2. Chemical smoke tests and air pressure/ flow measurements. Must have manometric readings of negative pressure of 0.02 inches of water or greater.

4.18 FINAL CHECK LIST BEFORE COMMENCEMENT OF ASBESTOS REMOVAL WORK

- A. Arrangements made for disposal of waste at an approved landfill.
- B. Work areas and Decon units conform to requirements specified above.
- C. Materials, tools, and equipment specified including waste receptors are on hand.
- D. All worker training has been completed.
- E. All submittals have been received and are in proper order.

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4.19 ASBESTOS REMOVAL AND CLEANUP

- A. Spray Asbestos materials with Amended Water using the airless sprayer to produce a fine spray. Wet Asbestos material freshly before Removal Work in manageably sized sections. Do not let Asbestos materials dry out once disturbed during the Work.
- B. Bag the wet Asbestos waste immediately to prevent drying and to prevent possible tracking of Asbestos wastes.
- C. Seal filled containers with the wet Asbestos waste in the Work Area. Wet clean the outside of the sealed bag and move to the Holding Area (bagout) for double bagging by workers who have entered from uncontaminated areas dressed in clean disposable suits. Only the double sealed bags and other cleaned materials will exit via the bagout. Persons will leave only via the Decon-shower route.
- D. The Asbestos materials must be packaged in impermeable dust tight containers (i.e., heavy-duty six-mil plastic bags or sealed fiber pack drums).
- E. All containers must be labeled in large legible letter:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST
AVOID CREATING DUST

- F. Waste shall be tagged or labeled clearly with the name of the generator i.e. the Asbestos Abatement Contractor and the name of the work site in accordance with NESHAP (40 CFR Part 61).
- G. After completion of Stripping Work, all surfaces from which Asbestos has been removed shall be wet brushed using a nylon brush, wet wiped and sponged or cleaned by an equivalent method to remove all visible material. During this Work the surfaces shall be kept wet. Wire brushes are not permitted.
- H. Remove visible accumulations of Asbestos material and debris. Wet clean all surfaces within the Work Area.
- I. Subsequent to the completion of all Asbestos Removal Work, clean all dried surfaces with a HEPA filtered vacuum.

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4.20 FINAL INSPECTION

- A. After cleaning each Work Area, and before installation of new materials, Contractor will make an initial visual inspection and notify the PM that Work is complete. An inspection by the PM shall then be conducted. If the PM finds that the Work is incomplete or that there are visible accumulations of residue, the Contractor shall repeat the cleaning at His expense until the Work Area is in compliance.

4.21 DISPOSAL

- A. The Asbestos Abatement Contractor will dispose of Asbestos wastes according to Applicable Regulations.
- B. The Asbestos Abatement Contractor will forward Asbestos Disposal Documentation: the original to the Owner and a copy to the PM.
- C. Impermeable double containers are to be used to receive and retain any Asbestos-containing or contaminated materials until disposal at an acceptable disposal site. Materials shall be adequately wet. Containers shall be labeled in accordance with OSHA 1926.1101 and shall be both water and airtight. All containers must be labeled in large legible letters:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST
AVOID CREATING DUST

- D. After the Asbestos waste container is deployed, it will remain locked unless in immediate use. The job Foreman or designated person will maintain control of the key.
- E. All vehicles transporting ACM waste shall be labeled during loading and unloading of the waste as per NESHAP regulations 40 CFR 61.150.
- F. All waste will be properly transported off-site at the end of each workday, for the duration of the abatement.
- G. Each waste container shall be tagged or labeled clearly with the name of the generator i.e. the Asbestos Abatement Contractor and the name of the work site in accordance with the NESHAP regulations (40 CFR Part 61, subpart M).
- H. Each Asbestos waste pickup will be signed for using chain of custody forms provided in the EPA regulations CFR 40 Part 61.

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4.22 MULTI-EMPLOYER WORKSITES

- A. All employers working on the site must receive the information delineated below. To a large extent, this is accomplished by giving each employer a copy of this specification.
- B. Each employer at the site is responsible for ensuring that his employees on site receives this information and makes provisions to protect his employees from asbestos exposure.
- C. In addition, the following are specific OSHA requirements for certain parties:
 - 1. General Contractor: Responsible for overall supervision. All parties must comply with the supervision of the general contractor on the site. The general contractor must make determinations of whether the Asbestos Abatement Contractor is in compliance with the OSHA asbestos standard cited herein.
 - 2. Asbestos Abatement Contractor:
 - a. Must inform other employers at the site of the nature of the work with asbestos, the existence of and the requirements of regulated areas, the measures to be taken to protect employees of the other employers from exposure, any breaches in the containment or enclosure, that these employers must ascertain on a daily basis that the containment or enclosure is secure.
 - b. Must inform all the other employers on the site of the location and quantity of ACM and the measures to be taken to protect them from exposure.
 - c. Within 10 days of completion of asbestos removal work, the Asbestos Abatement Contractor shall inform the owner and employers who will be working in the area of the quantity and PACM or ACM remaining in the former regulated area and the final monitoring results.
 - 3. All employers at the site:
 - a. Move their employees away from the regulated area until any breaches are corrected or
 - b. Provide the same protective equipment as specified herein for the Asbestos Abatement Contractor.
 - c. Regardless of who creates any asbestos hazard, the employer of exposed employees is required to comply with applicable protective provisions of 1926.1101 to protect his employees.

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4.22 MULTI-EMPLOYER WORKSITES (CONT)

- d. Employers who discover the presence of ACM or suspected ACM on the worksite must notify the project monitor or building owner and the other employers.
 - e. For inadvertently discovered ACM or PACM there is a 24-hour notification requirement to the owner and all employers at the site.
4. Building and or project owners:
- a. Before asbestos removal or repair work (class I, II or III work) is initiated, must notify their own employees and employers who are bidding on such work, of the quantity and location of ACM or PACM (presumed asbestos containing material) present in such areas.
 - b. Owners must also notify their own employees who work in or adjacent to such jobs.
 - c. The building owner must keep records of all information received which relates to the presence, location and quantity of ACM and PACM in the owner's building, project or vessel and transfer all such information to successive owners.

(Note: OSHA has defined 'building owner' to include those lessees who control the management and record keeping functions of a building/facility.)

4.23 EXPOSURE ASSESSMENT

- A Each employer, who has a workplace where asbestos abatement is conducted, must ensure that a competent person conducts an exposure assessment in accordance with 1926.1101 immediately before or at the initiation of the abatement to ascertain expected exposures.
- B. Each Initial Exposure assessment by the Competent Person shall include:
 - 1. Air monitoring historical data
 - 2. Degree and quality of supervision
 - 3. Employee training and experience
 - 4. Techniques used for wetting the ACM or PACM in the various circumstances encountered
 - 5. Placing and repositioning the ventilation equipment, and
 - 6. Impacts due to weather conditions

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4.24 PROHIBITIONS

- A. High-speed abrasive disc saws to cut ACM or PACM shall not be used unless inside the containment with HEPA filtered negative exhausts as herein specified or unless equipped with local HEPA filtered ventilation to collect contamination from cutting.
- B. Compressed air use for cleaning ACM or PACM contaminated surfaces is prohibited unless conducted inside the containment with HEPA filtered negative exhausts as herein specified.
- C. Dry shoveling or sweeping or other dry clean-up of dust and debris containing ACM or PACM is prohibited.
- D. Employee rotation as a means of reducing employee exposure is prohibited.
- E. Sanding ACM or PACM is prohibited.

4.25 RE-INSTALLATION OF DISPLACED EQUIPMENT

- A. Relocate objects moved to temporary locations during the Work to their proper positions.
- B. Re-secure mounted objects removed during the Work in their former positions.
- C. Re-establish HVAC, mechanical and electrical systems in proper working order and in conformance with all applicable building, mechanical and electrical codes.

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4.26 DEFINITIONS:

- A. *Abatement*: Procedures to control fiber release from Asbestos-containing materials; includes Removal, Encapsulation, and Enclosure.
- B. *Airlock*: A system for permitting ingress and egress while assuring air movement to a contaminated area from an uncontaminated area.
- C. *Air Monitoring*: The process of measuring the fiber content of a specific volume of air in a stated period of time.
- D. *Licensed Project Monitor (PM)*: A DPH Licensed professional capable of conducting air monitoring and analysis schemes. This individual is responsible for recognition of technical deficiencies in worker protection equipment and procedures during both planning and on-site phases of an Abatement project. Monitoring and worker protection. Air sampling shall be in accordance with NIOSH Method 7400 and as described in OSHA standards 29 CFR 1926.1101, or (as applicable for TEM) according to 40 CFR Part 763 Subpart E.
- E. *Amended Water*: Water to which a surfactant has been added.
- F. *Asbestos*: Asbestos is a name given to several naturally occurring fibrous silicates. There are two varieties of Asbestos; the serpentine form (Chrysotile) characterized by long, soft, flexible, and wavy fibers, and the amphiboles which occur as straight, needle-like fibers, and consist of crocidolite, amosite, anthophyllite, tremolite and actinolite. OSHA 1926.1101 defines as follows, “*Asbestos* includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that has been chemically treated and/or altered. For purposes of this standard, "asbestos" includes PACM, as defined below”.
- G. *ACM / Asbestos Containing Material*: A material which contains more than 1% Asbestos per EPA test Method 600/R-93/116.
- H. *Category 1 and 2 Asbestos materials*: Non-friable materials as defined in the amended NESHAP regulation 40 CFR 61, 11/20/90.
- I. *Class I Asbestos Abatement Work*: Removal of Thermal System Insulation and surfacing removal of ACM or PACM (TSI and Surfacing have the same meaning as in EPA AHERA except drywall is not classed as surfacing, but plaster is.)
- J. *Class II Asbestos Abatement Work*: Removal of ACM or PACM other than TSI and surfacing.
- K. *Class III work*: Repair and maintenance operations involving disturbance of ACM or PACM.

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4.28 DEFINITIONS (CONT):

- L. *Class IV work:* Maintenance and custodial work during which employees contact but do not disturb ACM or PACM and activities to clean up dust, waste and debris resulting from Class I, II, and III activities. Also work in areas with ACM or PACM such as dusting surfaces, vacuuming carpets, sweeping or mopping asbestos containing floors or floors in areas where ACM or PACM is present, changing a light bulb or battery in a smoke detector on a surfaced ceiling, polishing floor tile.
- M. *Clean Change Area:* An area equipped as specified herein so that workers can decontaminate their suits and change into street clothes without passing back through the regulated area.
- N. *Clean Room:* An uncontaminated area or room, which is a part of the Worker Decontamination Enclosure with provisions for storage of worker's street clothes and protective equipment.
- O. *Competent Person:* A person experienced in Asbestos Abatement with a current Asbestos Abatement Supervisor's Certificate from an EPA Approved Training Center. In addition, a person meeting the following requirements in 1926.32: "one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them."
- P. *Critical Barrier:* The last layer of plastic sheeting separating Work Areas from non-Work Areas. OSHA 1926.1101 defines it as "one or more layers of plastic sealed over all openings into a work area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in a work area from migrating to an adjacent area".
- Q. *Curtained Doorway:* A device to allow passage from one room to another while permitting minimal air movement between the rooms, typically constructed by placing two overlapping sheets of plastic over an existing or temporarily framed doorway, securing each along the top of the doorway, securing the vertical edge of one sheet along one vertical side of the doorway, and securing the vertical edge of the other sheet along the opposite vertical side of the doorway. Two curtained doorways spaced a minimum of six feet apart from an Airlock.
- R. *Decontamination Enclosure System (Decon.):* A series of connected rooms, with Curtained Doorways between any two (2) adjacent rooms, for the decontamination of workers and of materials and equipment which is connected to and adjacent to the regulated area. A Decontamination Enclosure System always contains at least one (1) Airlock.
- S. *DPH:* Connecticut Department of Public Health

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4.28 DEFINITIONS (CONT):

- T. *Encapsulant (sealant)*: a liquid material which can be applied to Asbestos-Containing Material, and which controls the possible release of Asbestos fibers from the material either by creating a membrane over the surface (bridging Encapsulant) or by penetrating into the material and binding its components together (penetrating Encapsulant). Any such Encapsulants shall be in conformance with Building and/or Fire Safety Code requirements.
- U. *Encapsulation*: All herein specified procedures necessary to apply an encapsulant to Asbestos-containing building materials to control the possible release of Asbestos fibers into the ambient air. The practice of spraying water damaged, loose, or hanging Asbestos material is not considered a satisfactory control method and is not considered Encapsulation for the purposes of this Specification. Encapsulation requires the same work area prep as removal and includes all the steps specified as follows:
 - a. Remove damaged, loose, or hanging areas of existing Asbestos material and place in sealable plastic bags for transport.
 - b. Repair damaged and missing areas to obtain a suitable base for sealing using Asbestos free replacement material in accordance with manufacturer's instructions.
 - c. Apply a final spray with Encapsulant.
- V. *Equipment Decontamination Enclosure*: That portion of a Decontamination Enclosure System (Decon) designed for controlled transfer of materials and equipment, typically consisting of a Washroom and a Holding area.
- W. *Encase*: To directly cover pipe insulation with an airtight impermeable cover such as re-moistenable cloth or conduit.
- X. *Equipment Room*: A contaminated area or room, which is part of the Worker Decontamination Enclosure with provisions for storage of contaminated clothing and equipment.
- Y. *Fixed Object*: A unit of equipment or furniture in the Work Areas, which cannot be removed from the Work Area.
- Z. *Friable Asbestos Material*: An Asbestos material that can be crumbled, pulverized, or reduced to powder when dry by hand pressure and which releases Asbestos fibers into the environment.
- AA. *HEPA Filter*: A high efficiency particulate air (HEPA) filter in compliance with ANSI Z9.2-1979. A filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter.
- BB. *HEPA Vacuum Equipment*: Vacuum equipment with a HEPA filter system for filtering the air effluent from the unit.
- CC. *Holding Area*: A chamber in the Equipment Decontamination Enclosure located between the Washroom and an uncontaminated area. The Holding area comprises an Airlock.
- DD. *Mini-Containment*: A fully contained small work area with decontamination unit, negative air that differs only in size from the containments herein specified.

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4.28 DEFINITIONS (CONT):

- EE. *Movable Object*: A unit of equipment or furniture in the Work Area, which can be removed from the Work Area.
- FF. *Negative Air Units or Negative Air Pressure Equipment*: A portable local exhaust system equipped with HEPA filtration used to create negative pressure in a contaminated area (negative with respect to adjacent uncontaminated areas) and capable of maintaining a constant discharge of filtered air outside and creating suction so that air flow direction moves from uncontaminated areas into the Work Areas.
- GG. *NESHAP*: National Emission Standards for Hazardous Air Pollutants, including Asbestos, administered by the EPA.
- HH. *NIOSH*: National Institute for Occupational Safety and Health.
- II. *Owner*: Cheshire Public Schools
- JJ. *PACM: Presumed Asbestos Containing Material. OSHA definition*: TSI or Surfacing. Note: OSHA also assumes roofing and resilient flooring to contain asbestos, but the work practices differ. EPA assumed ACM covers a much broader range of building materials.
- KK. *Permissible Exposure Limit (PEL)*: OSHA Standard. Eight (8) hour time weighted average (TWA) of 0.1 fibers per cubic centimeter of airborne Asbestos, tremolite, anthophyllite, actinolite, or a combination of these materials as determined by the method prescribed in appendix A to OSHA Regulations 29 CFR 1926.1101, or by an equivalent method.
- LL. *Plasticize*: To cover floors and walls with plastic sheeting as herein specified.
- MM. *Removal*: All herein specified procedures necessary to remove Asbestos Containing Materials from the designated areas and to transport and dispose of these materials at an acceptable site.
- NN. *Shower Room*: A room between the Clean Room and the Equipment Room in the Worker Decontamination Enclosure with hot and cold or warm running water and suitably arranged for complete showering during decontamination. The Shower Room comprises an Airlock between contaminated and clean areas.
- OO. *Stripping*: Taking of Asbestos materials from any surface.
- PP. *Surfactant*: A chemical wetting agent added to water to improve penetration.
- QQ. *Surfacing Material*: Material that is spray applied or troweled on or otherwise applied to surfaces.
- RR. *Thermal System Insulation (TSI)*: Material applied to pipes, fittings, boilers, breeching, tanks, ducts or other components to prevent heat loss or gain.

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4.28 DEFINITIONS (CONT):

- SS. *Washroom:* A room between the Work Area and the Holding Area in the Equipment Decontamination Enclosure with provisions for storage of contaminated clothing and equipment.
- TT. *Wet Cleaning:* The process of eliminating Asbestos contamination from building surfaces and objects by using cloths, mops, or other cleaning tools which have been dampened with water, and by afterwards disposing of these cleaning items as Asbestos contaminated waste.
- UU. *Work Area:* An area where Asbestos Abatement operations are performed, which is isolated by physical boundaries to prevent the spread of Asbestos dust, fibers, or debris; Designated rooms, spaces or areas of the project in which Asbestos Abatement actions are to be undertaken or which may become contaminated as a result of such Abatement actions. A contained Work Area is an area, which has been sealed, plasticized and equipped with a Decontamination Enclosure System.
- VV. *Worker Decontamination Enclosure System:* That portion of a Decontamination Enclosure System designated for controlled passage workers and other personnel and authorized persons typically consisting of a Clean Room, a Shower Room and an Equipment Room.

**DOOLITTLE ELEMENTARY SCHOOL – 735 CORNWALL AVENUE, CHESHIRE, CT
BATHROOM RENOVATION PROJECT**

PART 5 - LIST OF DRAWINGS

5.1 DRAWING NUMBER DESCRIPTION

**DOOLITTLE ELEMENTARY SCHOOL – FIRST FLOOR – BATHROOM RENOVATION
PROJECT DRAWINGS:**

- A. Drawing- Silver Petrucelli Renovation Plans, dated 3/14/2022

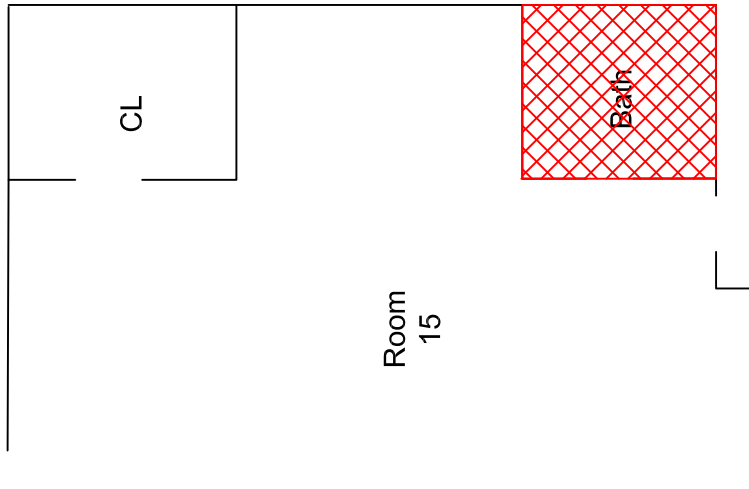
- B. Drawing- First Floor – Location of ACM sheetrock walls and ACM Pipe
Insulation assumed to be inside walls

C. DECONTAMINATION SYSTEM DETAIL FOUR (4) DRAWINGS

ACM Location Drawing



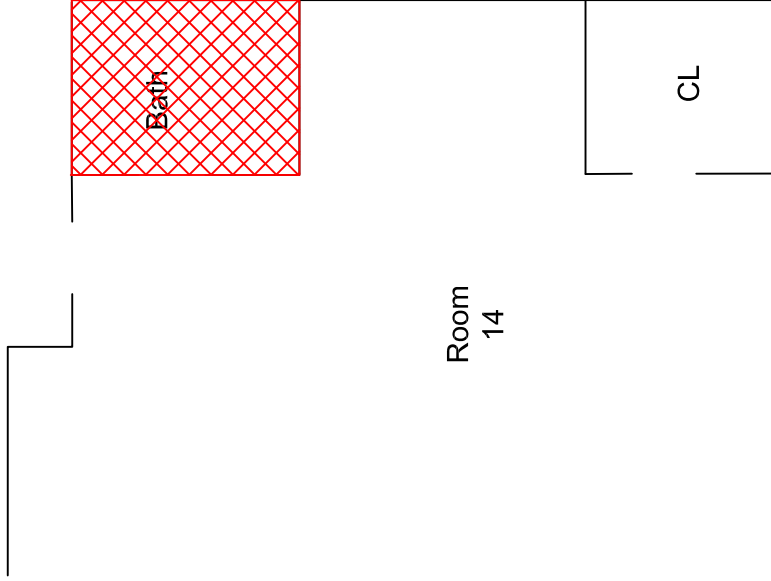
Approx. Location of ACM sheetrock walls and ACM pipe insulation assumed inside walls



SIDE B

Chem Scope Inc.
Asbestos Pre-Renovation Inspection
Doolittle Elementary School
735 Cornwall Avenue, Cheshire CT
CS# 206-277 03-15-2022

SIDE C



SIDE D

SIDE A

NORTH

LEGEND OF SYMBOLS

NOTATIONS

TOTAL SQUARE FEET =

DRAWN BY:

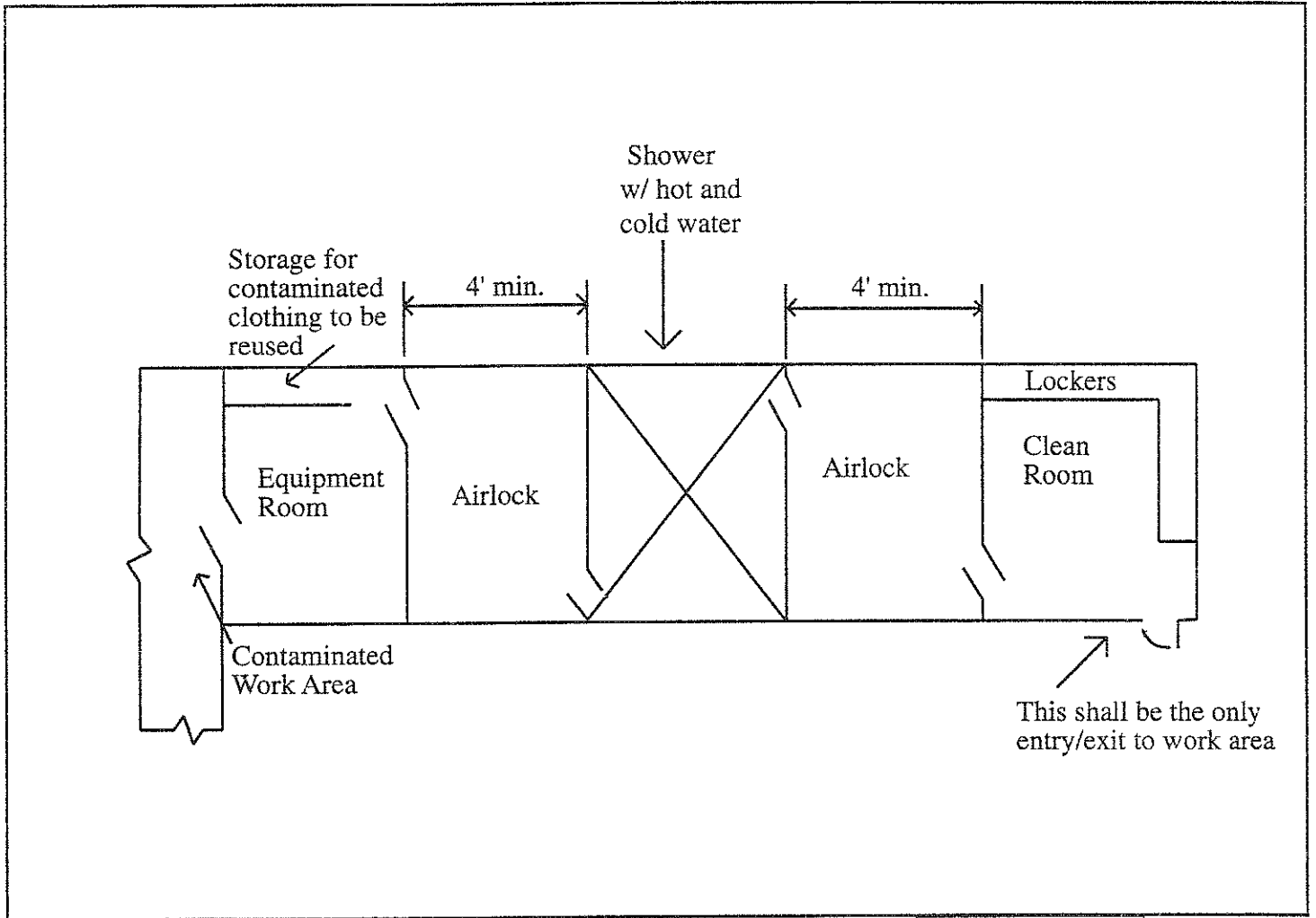
ChemScope Inc.

DATE PLOTT:

PLAN

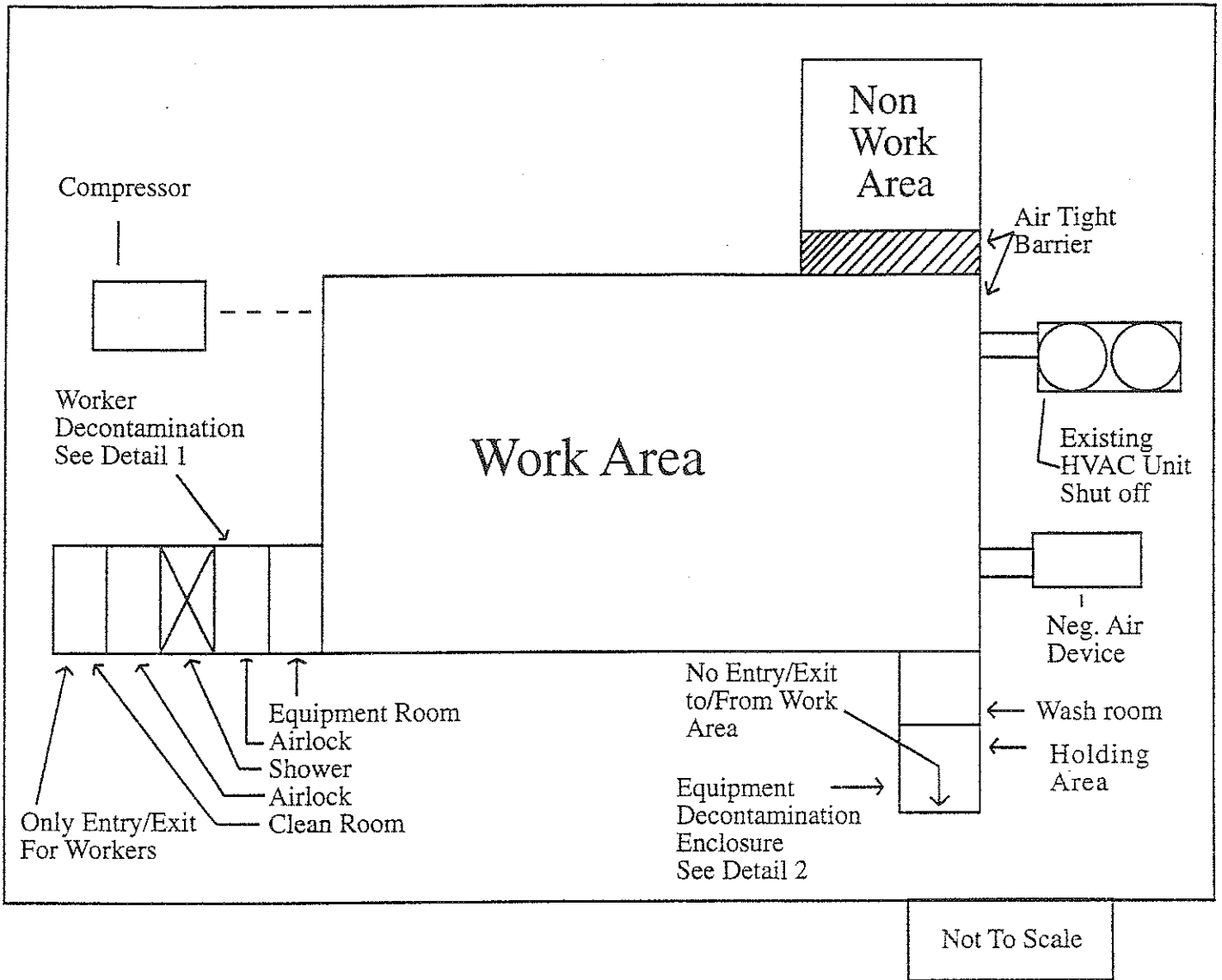
NOT TO SCALE

DATE

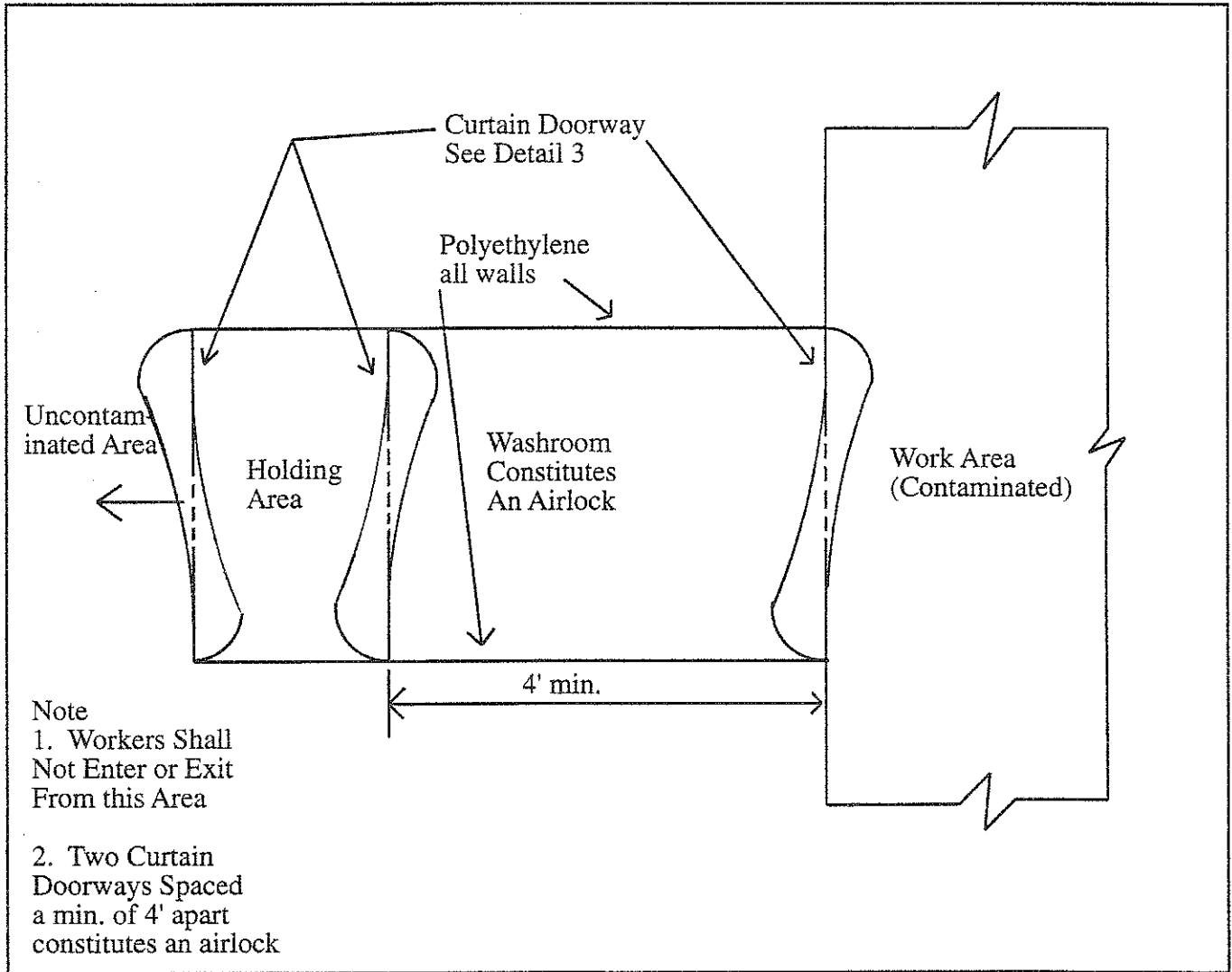


Not To Scale

Schematic of Worker Decontamination Enclosure Detail 1



Schematic Building Plan



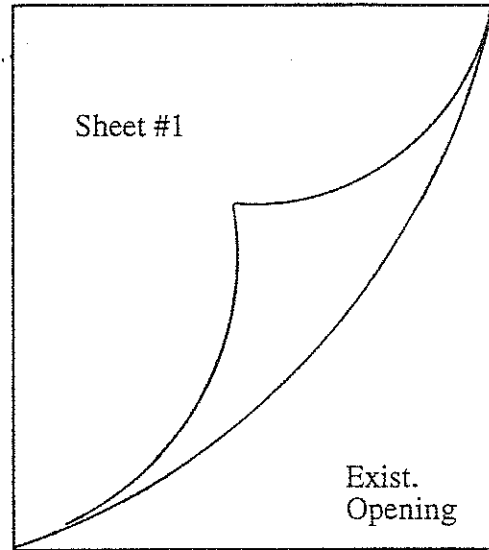
Not To Scale

Plan of Equip. Decontamination Enclosure Detail 2

END OF SECTION

1. Secure top Edge
of Sheet #1
Along Top Edge
of Opening

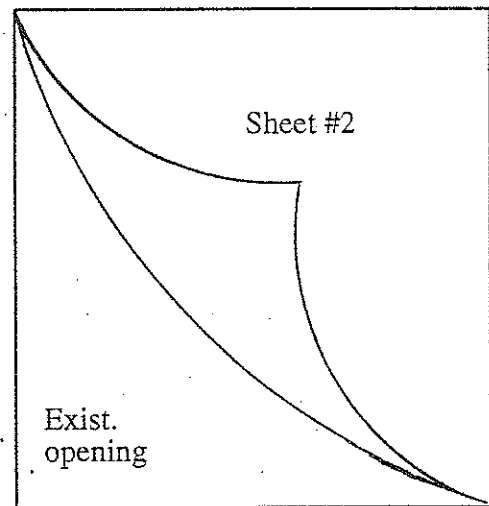
2. Secure Sheet #1
Along one vertical
side of opening



A

3. Secure Polyethylene
Sheet#2 Along
Top edge of opening

4. Secure Polyethylene
sheet #2 along opposite
side of opening as
sheet#1 was secured



B

Curtains Doorway Detail 3

APPENDIX A

Dan Bombero Jr.
Dept of Public Works & Engineering
Town of Cheshire
84 South Main Street
Cheshire CT 06410

03/21/2022

**ASBESTOS PRE-RENOVATION INSPECTION
DOOLITTLE ELEMENTARY SCHOOL
735 CORNWALL AVENUE, CHESHIRE CT
CS#206-277, 03/15/2022, Page 1 of 5**

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1	TABLE OF CONTENTS
2	INTRODUCTION
3-4	INSPECTION REPORT SYNOPSIS
4	LIMITATIONS OF INSPECTION
5	RECOMMENDATIONS

Attachments:

- Scope of Inspection Drawings (2 pages)
- ACM Location Drawing (1 page)
- PLM Certificate of Analysis Report with Chain of Custody Document (9 pages)
- Sample Location Drawings (2 pages)
- Site Inspector and Laboratory Credentials (5 pages)

Report Distribution:

rhaley@silverpetrucelli.com
dbombero@cheshirect.org

File Location:

NAS AAUM-Reports\AsbInsp\KD-PRERENO2022.doc

**ASBESTOS PRE-RENOVATION INSPECTION
DOOLITTLE ELEMENTARY SCHOOL
735 CORNWALL AVENUE, CHESHIRE CT
CS#206-277, 03/15/2022, Page 2 of 5**

INTRODUCTION

EXECUTIVE SUMMARY:

Asbestos containing materials (ACM) were detected within the scope of this inspection and will need to be properly removed (abated) and disposed of prior to renovation or demolition that would disturb these materials. Abatement work must be done by a licensed asbestos abatement contractor using proper procedures and practices with certified and trained individuals.

BUILDING DESCRIPTION:

The Doolittle Elementary School is a one-story building with a total area of about 47,720 sq ft constructed of steel and masonry. Heat from the boilers is distributed through pipe chases up to heat units in rooms. There is a duct system above the drop ceilings throughout the building. The original building was constructed in 1962 totaling about 41,295 sq ft. In 1979 there was a 6,425 sq ft addition put on. In 1965 and 1975 there were 3 portable buildings added. There were major renovations in 1994 and 1995. The portable classrooms were eliminated. New additions were installed in 1995.

PURPOSE AND SCOPE OF INSPECTION:

Asbestos Pre-Renovation Inspection as directed by Ryan Haley of Cheshire Public Schools. We understand that there are plans to renovate five existing bathrooms and part of adjacent classrooms at the subject single-story school building. It is our understanding that the renovation plans include the disturbance of floors, walls and ceilings of the Boy's Handicap Bathroom Next to 157, Girls Bathroom next to 157 and the Teacher's Bathroom next to 157. It is also our understanding that the bathrooms in Classrooms 14 and 15 are to be moved, which involves removing an existing closet to make room for the new bathrooms. We understand that you would like Chem Scope to conduct the required asbestos pre-renovation inspection prior to the start of any work and would also like us to include lead-based paint testing as the building was constructed prior to 1978. No other materials or areas were within the scope of this inspection.

Please see attached Scope of Inspection Drawing for details.

TEST PARAMETERS:

This is an Asbestos Pre-Renovation Inspection which is required by the EPA NESHAP Regulations for Building Renovations and Demolition, 40 CFR PART 61 intended to thoroughly inspect the affected part of the facility for asbestos prior to the renovation. The inspection is also needed for compliance with OSHA 1926.1101 and CT DPH 19a-332a-1 through 16.

Sampling completed following the Methods outlined in AHERA 40 CFR Part 763 Asbestos Containing Materials in Schools. EPA Wet Methods are used to prevent fiber release. Building materials sampled are analyzed at our laboratory by EPA method 600/R-93/116. This is currently the approved EPA Test method, which uses Polarized Light Microscopy with Dispersion Staining. The laboratory is accredited by NIST/NVLAP and AIHA Lab Accreditation Program, LLC, and is a Connecticut Approved Environmental Laboratory for Asbestos Analysis.

This investigation and information provided in this report depends partly on background information provided by the client. This report is intended for the use of the client. The scope of services performed may not be appropriate for other users and any use of this report by third parties is at their sole risk. This report is intended to be used in its entirety. No excerpts may be taken to be representative of this report.

**ASBESTOS PRE-RENOVATION INSPECTION
DOOLITTLE ELEMENTARY SCHOOL
735 CORNWALL AVENUE, CHESHIRE CT
CS#206-277, 03/15/2022, Page 3 of 5**

INSPECTION REPORT SYNOPSIS

LOCATION NAME AND ADDRESS: Doolittle Elementary School
735 Cornwall Avenue, Cheshire CT

INSPECTION DATE(S): 03/15/2022

QUALIFICATIONS: The inspection was conducted by inspector(s): Kristina Dykes

Miss Kristina Dykes:

- EPA and State of Connecticut Accredited Asbestos Inspector, Project Monitor
- State of Connecticut Licensed Asbestos Inspector (#000987).
- State of Connecticut Licenses Asbestos Project Monitor (#000822).

03/15/22022: SITE OBSERVATIONS: The following observations were made:

- We were provided access to the area by the custodian.
- Noticed that the flooring, walls and ceilings were intact.

FINDINGS:

The following asbestos containing materials (ACM) were detected within the Scope of the Inspection (cont):

<u>MATERIAL</u>	<u>LOCATION</u>	<u>~FOOTAGE</u>
White/beige thin/brittle taping compound painted tan *on grey crumbly sheetrock with brown fibrous paper backing (from wall)	First Floor – Room 14 Bath Room 15 Bath	7 SF each
		<u>Total: 14 SF</u>
Assumed ACM pipe fittings fittings from behind cinder block	First Floor – Room 14 Bath,	10 SF
Assumed ACM pipe fittings fittings from behind cinder block	First Floor – Room 15 Bath,	10 SF
		<u>Total: 20 SF</u>

*Because the material attached to this material contains asbestos, this material will need to be treated as an asbestos containing material (ACM).

The following is a summary table of the materials that tested as non-Asbestos Containing Material (ACM) (<1%) within the Scope of Work (not already summarized above):

Location	Material	Sample #'s	Findings
First Floor – Room 14 and Room 15	Brown/yellow pliable glue (from behind green vinyl baseboard from wall)	206-277-1 206-277-2	No Asbestos Detected
First Floor – Girls Bath and Boys Bath	Grey fibrous tile with silver metallic face coat with pinholes painted white (from ceiling)	206-277-3 206-277-4	No Asbestos Detected

**ASBESTOS PRE-RENOVATION INSPECTION
DOOLITTLE ELEMENTARY SCHOOL
735 CORNWALL AVENUE, CHESHIRE CT
CS#206-277, 03/15/2022, Page 4 of 5**

INSPECTION REPORT SYNOPSIS (CONT):

The following is a summary table of the materials that tested as non-Asbestos Containing Material (ACM) (<1%) within the Scope of Work (not already summarized above):

Location	Material	Sample #'s	Findings
First Floor – Boys Bath and Girls Bath	Brown thin brittle grout with off-white pliable spacer material (from between beige ceramic tile) on light grey granular mortar (on concrete from floor)	206-277-(5-8)	No Asbestos Detected
First Floor – Girls Bath and Boys Bath	White thin brittle grout (from between white ceramic tile) on white/dark grey granular mortar (from baseboard from wall)	206-277-9 206-277-10 206-277-11 206-277-12	No Asbestos Detected
First Floor – Boys Bath and Girls Bath	White brittle taping compound painted tan on grey crumbly sheetrock with brown fibrous paper backing (from wall)	206-277-13 206-277-14 206-277-15 206-277-16	No Asbestos Detected
First Floor – Girls Bath and Boys Bath	Yellow hard caulking (from metal ductwork above drop ceiling)	206-277-17 206-277-18	No Asbestos Detected
First Floor – Room 15 CL	Light pink with dark pink streaks hard 12x12 tile on orange sticky mastic (on concrete from floor)	206-277-19 206-277-20 206-277-21 206-277-22	No Asbestos Detected
First Floor – Room 14 CL	Beige hard 12x12 tile on yellow/gray sticky/crumbly mastic (on concrete from floor)	206-277-23 206-277-24 206-277-25 206-277-26	No Asbestos Detected
First Floor – Room 15 Bath and Room 14 Bath	White thin/brittle taping compound painted white on grey crumbly sheetrock with brown fibrous paper backing (from ceiling)	206-277-31 206-277-32 206-277-33 206-277-34	No Asbestos Detected
First Floor – Room 14 Bath and Room 15 Bath	Dark grey thin granular grout (from between tan/brown ceramic tile) on dark grey granular mortar (on concrete from floor)	206-277-35 206-277-36 206-277-37 206-277-38	No Asbestos Detected

LIMITATIONS OF SAMPLING

It is important to note that every effort is made to detect asbestos (ACM) in the path of the renovation by our inspectors. It is not practical or prudent to demolish the entire flooring system, walls and ceilings during an inspection. The owner should be aware of this in case suspect materials or concealed suspect materials are uncovered during the actual renovation.

If suspect materials that were previously not accessible or not sampled during this inspection are discovered during the renovation, or if the scope of the renovation changes to include disturbance of new materials not inspected, then renovation must stop and the materials must be sampled by a CT DPH licensed asbestos inspector prior to disturbance of these materials.

**ASBESTOS PRE-RENOVATION INSPECTION
DOOLITTLE ELEMENTARY SCHOOL
735 CORNWALL AVENUE, CHESHIRE CT
CS#206-277, 03/15/2022, Page 5 of 5**

RECOMMENDATIONS

All Asbestos Containing Materials (ACM) detected in the path of the inspection must be removed prior to the disturbance of these materials.

Asbestos removal is regulated by federal and state agencies. Abatement work must be done by a licensed asbestos abatement contractor using proper procedures and practices, including containment, decontamination facilities, and negative air units and trained and CT DPH licensed workers. Final re-occupancy testing is also required, if the building is going to be reoccupied after the asbestos removal and strongly recommended even if the building is not going to be re-occupied such as in the case of building demolition, for removal of greater than three (3) sq. ft or linear ft of ACM. A CT DPH Licensed Project Monitor is always required for final visual inspections after asbestos removal.

Please also keep in mind that notification to the DPH is required for asbestos abatement involving greater than 10 linear feet or 25 square feet of ACM when renovation or demolition activities are performed. Disposal of all ACM is regulated by EPA and the Connecticut DEEP; an authorized landfill must be used.

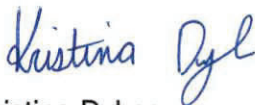
OSHA regulations 1926.1101 requires that before asbestos removal or repair work (class I, II or III work) is initiated, building owners/facility owners must notify their own employees and employers who are bidding on such work, of the quantity and location of ACM or PACM (presumed asbestos containing material) present in such areas. Also for inadvertently discovered ACM or PACM there is a 24-hour notification requirement to the owner and all employers at the site.

Notification to the EPA is also required for project involving any demolition regardless of regulated asbestos containing material (RACM) amount or renovation which may disturb more than 260 linear feet or 160 square feet of RACM.

Section 19a-333-7 of the Regulations of Connecticut State Agencies prohibits the performance of asbestos abatement in a school building while school is in session (or at any time while children are in the school) without the prior written approval of the DPH. This includes interior asbestos abatement, and it is the interpretation of the DPH Asbestos Program that the removal of exterior friable asbestos-containing material constitutes asbestos abatement, as defined by Connecticut General Statute Section 19a-332. Therefore, a local education agency is required to obtain the prior written approval of the DPH to remove the interior and exterior friable materials at this site while school is in session.

At a minimum for abatement while school is not in session or when children are not in the school, the school system must send a letter to the CT-DPH to inform them of the abatement and that no children/students will be in the school building at the time of the abatement.

Sincerely,



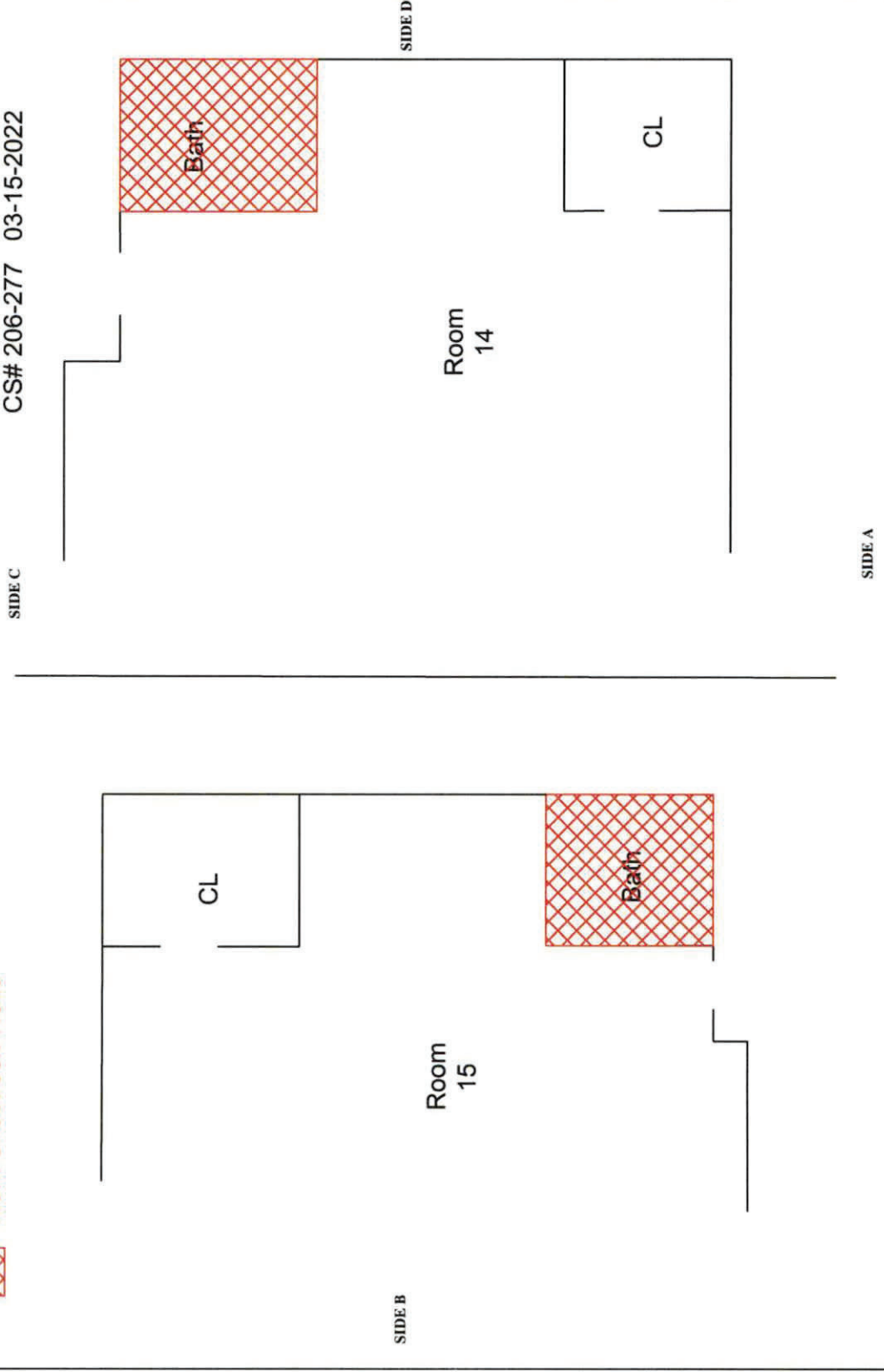
Kristina Dykes
Asbestos Inspector

ACM Location Drawing



Approx. Location of
ACM Sheetrock Walls

Chem Scope Inc.
Asbestos Pre-Renovation Inspection
Doolittle Elementary School
735 Cornwall Avenue, Cheshire CT
CS# 206-277 03-15-2022



NOTES

LEGEND OF SYMBOLS

SYMBOL	DESCRIPTION

NOTATIONS

TOTAL SQUARE FEET *

ChemScope Inc.

PLAN

NOT TO SCALE

Certificate Of Analysis

Cheshire Public Works
84 South Main Street
Cheshire CT 06410

03/18/2022

CS#: 206-277

Page 1 of 7

Bulk sample(s) from Doolittle Elementary School, 735 Cornwall Avenue, Cheshire, CT collected by Kristina Dykes on 03/15/2022

Examination made by Polarized Light Microscopy (PLM) per EPA Appendix E to Subpart E of 40 CFR Part 763 and EPA Test Method 600/R-93/116

Sample Identification

206-277-1 Brown/yellow pliable glue (from behind green vinyl baseboard from wall)/First Floor - Room 14

Findings (Analyzed 03/18/2022)

No Asbestos Detected
70% Non- Fibrous Particles
30% Volatile on Ignition

206-277-2 Brown/yellow pliable glue (from behind green vinyl baseboard from wall)/First Floor - Room 15

No Asbestos Detected
52% Non- Fibrous Particles
48% Volatile on Ignition
<1% Wollastonite

206-277-3 Grey fibrous tile with silver metallic face coat with pinholes painted white (from ceiling)/First Floor - Girls Bath

No Asbestos Detected
17% Non- Fibrous Particles
17% Volatile on Ignition
66% Mineral Wool

206-277-4 Grey fibrous tile with silver metallic face coat with pinholes painted white (from ceiling)/First Floor - Boys Bath

No Asbestos Detected
16% Non- Fibrous Particles
18% Volatile on Ignition
66% Mineral Wool

206-277-5 Brown thin brittle grout with off-white pliable spacer material (from between beige ceramic tile on light grey granular mortar on concrete from floor)/First Floor - Boys Bath

No Asbestos Detected
78% Non- Fibrous Particles
22% Volatile on Ignition

Bulk sample(s) from Doolittle Elementary School, 735 Cornwall Avenue, Cheshire, CT collected by Kristina Dykes on 03/15/2022

Examination made by Polarized Light Microscopy (PLM) per EPA Appendix E to Subpart E of 40 CFR Part 763 and EPA Test Method 600/R-93/116

Sample Identification

Findings (Analyzed 03/18/2022)

206-277-6 Brown thin brittle grout with off-white pliable spacer material (from between beige ceramic tile on light grey granular mortar on concrete from floor)/First Floor - Girls Bath

No Asbestos Detected
77% Non- Fibrous Particles
23% Volatile on Ignition

206-277-7 Light grey granular mortar (from sample #5)/First Floor - Boys Bath

No Asbestos Detected
87% Non- Fibrous Particles
13% Volatile on Ignition

206-277-8 Light grey granular mortar (from sample #6)/First Floor - Girls Bath

No Asbestos Detected
87% Non- Fibrous Particles
13% Volatile on Ignition

206-277-9 White thin brittle grout (from between white ceramic tile on white/dark grey granular mortar from baseboard from wall)/First Floor - Girls Bath

No Asbestos Detected
90% Non- Fibrous Particles
10% Volatile on Ignition

206-277-10 White thin brittle grout (from between white ceramic tile on white/dark grey granular mortar from baseboard from wall)/First Floor - Boys Bath

No Asbestos Detected
88% Non- Fibrous Particles
12% Volatile on Ignition

206-277-11 White/dark grey granular mortar (from sample #9)/First Floor - Girls Bath

No Asbestos Detected
88% Non- Fibrous Particles
12% Volatile on Ignition

206-277-12 White/dark grey granular mortar (from sample #10)/First Floor - Boys Bath

No Asbestos Detected
92% Non- Fibrous Particles
8% Volatile on Ignition

Bulk sample(s) from Doolittle Elementary School, 735 Cornwall Avenue, Cheshire, CT collected by Kristina Dykes on 03/15/2022

Examination made by Polarized Light Microscopy (PLM) per EPA Appendix E to Subpart E of 40 CFR Part 763 and EPA Test Method 600/R-93/116

Sample Identification

Findings (Analyzed 03/18/2022)

206-277-13 White brittle taping compound painted tan (on grey crumbly sheetrock with brown fibrous paper backing from wall)/First Floor - Boys Bath

No Asbestos Detected
84% Non- Fibrous Particles
16% Volatile on Ignition
<1% Wollastonite

206-277-14 White brittle taping compound painted tan (on grey crumbly sheetrock with brown fibrous paper backing from wall)/First Floor - Girls Bath

No Asbestos Detected
86% Non- Fibrous Particles
14% Volatile on Ignition
<1% Wollastonite

206-277-15 Grey crumbly sheetrock with brown fibrous paper backing (from sample #13)/First Floor - Boys Bath

No Asbestos Detected
75% Non- Fibrous Particles
21% Volatile on Ignition
4% Fiberglass

206-277-16 Grey crumbly sheetrock with brown fibrous paper backing (from sample #14)/First Floor - Girls Bath

No Asbestos Detected
69% Non- Fibrous Particles
27% Volatile on Ignition
4% Fiberglass

206-277-17 Yellow hard caulking (from metal ductwork above drop ceiling)/First Floor - Girls Bath

No Asbestos Detected
59% Non- Fibrous Particles
41% Volatile on Ignition

206-277-18 Yellow hard caulking (from metal ductwork above drop ceiling)/First Floor - Boys Bath

No Asbestos Detected
64% Non- Fibrous Particles
36% Volatile on Ignition

206-277-19 Light pink with dark pink streaks hard 12x12 tile (on orange sticky mastic on concrete from floor)/First Floor - Room 15 CL

No Asbestos Detected
84% Non- Fibrous Particles
16% Volatile on Ignition

Bulk sample(s) from Doolittle Elementary School, 735 Cornwall Avenue, Cheshire, CT collected by Kristina Dykes on 03/15/2022

Examination made by Polarized Light Microscopy (PLM) per EPA Appendix E to Subpart E of 40 CFR Part 763 and EPA Test Method 600/R-93/116

Sample Identification

Findings (Analyzed 03/18/2022)

206-277-20 Light pink with dark pink streaks hard 12x12 tile (on orange sticky mastic on concrete from floor)/First Floor - Room 15 CL

No Asbestos Detected
83% Non- Fibrous Particles
17% Volatile on Ignition

206-277-21 Orange sticky mastic (from sample #19)/First Floor - Room 15 CL

No Asbestos Detected
13% Non- Fibrous Particles
87% Volatile on Ignition

206-277-22 Orange sticky mastic (from sample #20)/First Floor - Room 15 CL

No Asbestos Detected
40% Non- Fibrous Particles
60% Volatile on Ignition

206-277-23 Beige hard 12x12 tile (on yellow/gray sticky/crumblly mastic on concrete from floor)/First Floor - Room 14 CL

No Asbestos Detected
85% Non- Fibrous Particles
15% Volatile on Ignition

206-277-24 Beige hard 12x12 tile (on yellow/gray sticky/crumblly mastic on concrete from floor)/First Floor - Room 14 CL

No Asbestos Detected
85% Non- Fibrous Particles
15% Volatile on Ignition

206-277-25 Yellow/gray sticky/crumblly mastic (from sample #23)/First Floor - Room 14 CL

No Asbestos Detected
52% Non- Fibrous Particles
48% Volatile on Ignition

206-277-26 Yellow/gray sticky/crumblly mastic (from sample #24)/First Floor - Room 14 CL

No Asbestos Detected
49% Non- Fibrous Particles
51% Volatile on Ignition

Bulk sample(s) from Doolittle Elementary School, 735 Cornwall Avenue, Cheshire, CT collected by Kristina Dykes on 03/15/2022

Examination made by Polarized Light Microscopy (PLM) per EPA Appendix E to Subpart E of 40 CFR Part 763 and EPA Test Method 600/R-93/116

Sample Identification

206-277-27 White/beige thin/brittle taping compound painted tan (on grey crumbly sheetrock with brown fibrous paper backing)/First Floor - Room 14 Bath

206-277-28 White/beige thin/brittle taping compound painted tan (on grey crumbly sheetrock with brown fibrous paper backing)/First Floor - Room 15 Bath

206-277-29 Grey crumbly sheetrock with brown fibrous paper backing (from sample #27)/First Floor - Room 14 Bath

206-277-30 Grey crumbly sheetrock with brown fibrous paper backing (from sample #28)/First Floor - Room 15 Bath

206-277-31 White thin/brittle taping compound painted white (on grey crumbly sheetrock with brown fibrous paper backing from ceiling)/First Floor - Room 15 Bath

206-277-32 White thin/brittle taping compound painted white (on grey crumbly sheetrock with brown fibrous paper backing from ceiling)/First Floor - Room 14 Bath

206-277-33 Grey crumbly sheetrock with brown fibrous paper backing (from sample #31)/First Floor - Room 15 Bath

Findings (Analyzed 03/18/2022)

2% Chrysotile Asbestos (point counted)
(*Confidence Interval = 1.6% - 2.6%)
73% Non- Fibrous Particles
25% Volatile on Ignition
<1% Wollastonite
*Estimate of the Error @ 95% Confidence Level

Not Analyzed

Not Analyzed

Not Analyzed

No Asbestos Detected
91% Non- Fibrous Particles
9% Volatile on Ignition
<1% Wollastonite

No Asbestos Detected
63% Non- Fibrous Particles
37% Volatile on Ignition
<1% Wollastonite

No Asbestos Detected
68% Non- Fibrous Particles
24% Volatile on Ignition
8% Fiberglass

Bulk sample(s) from Doolittle Elementary School, 735 Cornwall Avenue, Cheshire, CT collected by Kristina Dykes on 03/15/2022

Examination made by Polarized Light Microscopy (PLM) per EPA Appendix E to Subpart E of 40 CFR Part 763 and EPA Test Method 600/R-93/116

Sample Identification

Findings (Analyzed 03/18/2022)

206-277-34 Grey crumbly sheetrock with brown fibrous paper backing (from sample #32)/First Floor - Room 14 Bath

No Asbestos Detected
73% Non- Fibrous Particles
19% Volatile on Ignition
8% Fiberglass

206-277-35 Dark grey thin granular grout (from between tan/brown ceramic tile on dark grey granular mortar on concrete from floor)/First Floor - Room 14 Bath

No Asbestos Detected
90% Non- Fibrous Particles
10% Volatile on Ignition

206-277-36 Dark grey thin granular grout (from between tan/brown ceramic tile on dark grey granular mortar on concrete from floor)/First Floor - Room 15 Bath

No Asbestos Detected
92% Non- Fibrous Particles
8% Volatile on Ignition

206-277-37 Dark grey granular mortar (from sample #35)/First Floor - Room 14 Bath

No Asbestos Detected
89% Non- Fibrous Particles
11% Volatile on Ignition

206-277-38 Dark grey granular mortar (from sample #36)/First Floor - Room 15 Bath

No Asbestos Detected
91% Non- Fibrous Particles
9% Volatile on Ignition

**PARAMETERS
ASBESTOS PLM ANALYSIS
(Revised 12/9/19)**

1. *Materials which contain >1% asbestos (greater than 1%) by PLM (polarizing light microscopy) analysis are considered to be asbestos containing materials under EPA and the State of Connecticut Regulations. OSHA still regulates material with <1%. (Contact laboratory for information.) {Note: A more sensitive method is available called TEM (transmission electron microscopy). TEM may detect asbestos fibers that PLM cannot see, but the above agencies' enforcement is based on PLM analysis. Rules may differ for states other than Connecticut. It is best to check with the individual state. For example, New York State requires TEM confirmation of negative PLM results on floor tile}.*
2. *If no asbestos is detected in a sample, or if the asbestos content is less than 1 % by PLM, additional samples of the same material should be submitted for confirmation. Please check with the laboratory for guidance on the number of samples needed. Sample collection in Connecticut must be by a DPH Licensed Asbestos Inspector. Many other states also require licensing.*
3. *Floor Tile Mastic: Mastic under floor tile should be separately sampled by scraping some of the mastic from the floor to avoid contamination from the floor tile.*
4. *Although ChemScope, Inc. takes great effort to insure accuracy in the estimation of asbestos in the materials analyzed, no quantitation method is without some uncertainty. Based on independent calibration studies and comparison of ChemScope's quantitative results with NVLAP and AIHA, LAP programs we estimate our relative error (@ 95% Confidence Level) to be 0.26%. This means an estimated 10% asbestos has a Confidence Interval of 7.4-12.6% Asbestos. Likewise, a sample with an estimated 1% asbestos has a Confidence Interval of 0.74-1.26% Asbestos.*
5. *The presence of non-asbestos components, which are recognized by the PLM analyst, are reported with the estimated amounts. This is not an exhaustive analysis for the non-asbestos materials since the primary purpose is to determine if asbestos is present and, if so, how much is present of each type of asbestos.*
6. *Results reported apply only to the sample(s) analyzed.*
7. *Special treatment of samples: Chem Scope, Inc. routinely uses gravimetric sample reduction techniques such as low temperature ashing or acid dissolution on samples like floor tile, roofing materials, glue dots, or high cellulose content samples prior to PLM analysis. These methods are used to aid in the PLM analysis and to provide better quantitative data. Layered samples, if possible, are analyzed separately as individual layers. However, in accordance with the method, if any layer contains >1% asbestos (greater than 1%) it is to be considered an asbestos containing material. All results are reported to the original sample basis.*
8. *Sample results are not corrected for blanks. Analytical blanks are run daily and if contamination is suspected the samples are rerun.*
9. *Chem Scope, Inc. performs "400 point" point counting when the asbestos content is visually estimated to be less than 10%. There is no additional charge for this analysis.*

The Scope of Accreditation referenced in this report applies to bulk asbestos fiber analysis by PLM (Polarized Light Microscopy).

Accreditation does not imply endorsement by NVLAP, NIST or any Federal or State Agency.

This report pertains only to the samples tested and may not be reproduced in part.

Condition of the samples at the time of receipt was acceptable unless otherwise noted on the Certificate of Analysis.

See test parameters above and on attached chain of custody form.

We would love to hear from you. Comments? Questions? Please call or email us at chem.scope@snet.net

ChemScope, Inc. is accredited by AIHA LAP, LLC LAB #100134

NVLAP Lab Code 101061-0.

Connecticut Department of Public Health (DPH) Approved Environmental Lab PH 0581

Rhode Island Department of Health - Asbestos Program Certification #PLM00070

Signature

Analyst

*Signature
(if applicable)*

Inspector

Authorized Signature or
Suzanne Cristante
Laboratory Director

Authorized Signature or
Izabela Kremens
Quality Manager

Authorized Signature

Daniel Sullivan
President

ChemScope

INDUSTRIAL HYGIENE • ENVIRONMENTAL CHEMISTRY

15 Moulthrop Street, North Haven, CT 06473-3686 • Phone (203) 865-5605 • Fax (203) 498-1610

Emailed _____
Faxed _____
Called _____
Logged _____

Chain of Custody

Doolittle Elementary School

Sample Source: 735 Cornwall Avenue, Cheshire, CT

CS Job # 206-277

Sampled By: KD Date Sampled: 3/15/20 Customer Name: Cheshire Public Works

CS Sample#	Client Sample#	Sample Description	Comments

Sample Turnaround: 3 Days

Analysis Requested (if variable, use comment column): PLM

Check if you want sample returned _____ (sample will be disposed of after 30days).

Relinquished by K Dikos Date 3/15/20 Time 4:45pm Received By Lab

Other Special Instructions: _____

Result Transmittal Instructions (for Chem Scope to transmit): _____

FOR CHEM SCOPE, INC. TO FILL OUT IF SAMPLES ARE GOING TO OUTSIDE LABORATORY:

Name of Laboratory: _____

Method of Transportation to Laboratory: _____

Result Transmittal Instructions (for outside Laboratory to Chem Scope, Inc): _____

The person submitting samples is responsible for obtaining true and representative samples, for complying with applicable regulations and for the use of the data obtained from the analysis. For example, many states have licensing and laboratory approval requirements. Please contact the individual states if you have any questions regarding specific sampling or approval requirements. For Connecticut, sites we have licensed inspectors available to collect client samples and to perform building inspections.

Dear Laboratory Customer or Potential Customer,

New laboratory accreditation standards require us to provide our clients information about our services to make sure that your requirements for testing are adequately defined, documented and understood. The following is for your information. Please call us if you have any questions or comments.

Type of Samples

// PCM cassettes are routinely run by NIOSH Method 7400. (Issue #3, 14 June 2019)

// Bulk materials are run per EPA Appendix E to subpart of 40CFR part 763 and EPA Test method 600/R-93/116

Air Samples: NIOSH 7400 Method counts all fibers. This method may be used for personal air samples and for finals. Two field blanks must be submitted for each set of samples. In the unlikely event that there is to be any deviation from the standard test, you will be consulted by phone before the work begins. Those clients who have not had NIOSH 582 or AHERA asbestos training courses (either supervisor or project monitor) should consult with the lab director for more information. The test parameters are further explained in the analytical report.

Bulk materials: sampled are analyzed by the latest EPA Method: (#600/R-93/116) which uses polarized light microscopy (PLM). When asbestos is detected and the amount is estimated to be less than 10%, we automatically point count the samples. When there are interfering substances present, we may use ashing, acid washing or other procedures described in the method to handle the interference. Those clients who have not had AHERA asbestos training courses (either inspector, supervisor or project designer) should consult with the lab director for more information. The test parameters are further explained in the analytical report.

All Samples must be clearly labeled with source name and identification number or sufficient information from the client to make this sample uniquely identified. (We will then add our notebook #, page # (batch) and unique number within the batch.) Samples must be in a clean, air tight package such as a zip loc bag. Appropriate completed paperwork must accompany the sample. Bulk and air samples may not be submitted in the same package.

As soon as available bench top results will be faxed to you and reports will then be mailed. We will retain air samples for at least three months and bulk samples for 6 months unless you advise us otherwise.

You are welcome to visit the laboratory at any time to discuss the work, monitor the work or verify our testing services. We appreciate your business and encourage any feedback regarding improving our services or our quality system. Please take a minute to complete the following survey and mail/fax it to ChemScope, Inc.

Customer Service Survey

To help us improve our services give your opinions to the following:

1- The printed laboratory report was complete and easy to understand. YES__ NO__
If no, please explain _____

2- The turn around time for results met your expectations/needs. YES__ NO__
If no, please explain _____

3- How likely are you to recommend ChemScope Inc. to someone?
Excellent__ Very Good__ Good__ Fair__ Poor__

4- How likely are you to return to ChemScope in the future if the need arises?
Excellent__ Very Good__ Good__ Fair__ Poor__

5. On a scale of 1 to 5 where 1 represents "Satisfied" and 5 represents "Dissatisfied", how would you rate your level of overall satisfaction.

1__ 2__ 3__ 4__ 5__

6- Please add any additional comments or suggestions that would be helpful when you use our services:

Name _____ Company _____

Address _____ Telephone/e-mail _____

Can we contact you regarding this survey? YES__ NO__

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

PURSUANT TO THE PROVISIONS OF THE GENERAL STATUTES OF CONNECTICUT

THE INDIVIDUAL NAMED BELOW IS CERTIFIED
BY THIS DEPARTMENT AS A

ASBESTOS CONSULTANT-INSPECTOR

KRISTINA M DYKES

CERTIFICATE NO
000987

CURRENT THROUGH
03/31/23

VALIDATION NO.
03-941062

Kristina Dykes
SIGNATURE

Monica J. Gorman
COMMISSIONER

CERT#: A-509-Virtual.739

CHEMSCOPE TRAINING DIVISION
ASBESTOS INSPECTOR REFRESHER
4-HOUR TRAINING CERTIFICATE

Kristina May Dykes

15 Moulthrop Street, North Haven CT

Has attended a 4-hour annual refresher course on the subject discipline on
10/22/2021 and has passed a written examination.

"The person receiving this certificate has completed the requisite training for asbestos accreditation as an inspector under TSCA Title II"

Course topics include a review and update on asbestos health hazards, functions of inspectors and management planners, building systems, planning, inspecting for asbestos, sampling and analysis, respiratory protection, government regulations and preparing the inspection report.

This training course has been accredited by the State of Connecticut.

Examination Score: 98%

Exam Date: 10/22/2021

Expiration Date: 10/22/2022



Daniel Sullivan
Training Manager

Chem Scope, Inc.
15 Moulthrop Street
North Haven CT 06473
Phone: 203.865.5605
www.chem-scope.com



AIHA Laboratory Accreditation Programs, LLC

acknowledges that

Chemscope, Inc.

15 Moulthrop Street North Haven, CT 06473-3633

Laboratory ID: LAP-100134

along with all premises from which key activities are performed, as listed above, has fulfilled the requirements of the AIHA Laboratory Accreditation Programs (AIHA-LAP), LLC accreditation to the ISO/IEC 17025:2017 international standard, General Requirements for the Competence of Testing and Calibration Laboratories in the following:

LABORATORY ACCREDITATION PROGRAMS

- INDUSTRIAL HYGIENE Accreditation Expires: September 01, 2022
- ENVIRONMENTAL LEAD Accreditation Expires:
- ENVIRONMENTAL MICROBIOLOGY Accreditation Expires:
- FOOD Accreditation Expires:
- UNIQUE SCOPES Accreditation Expires:

Specific Field(s) of Testing (FoT)/Method(s) within each Accreditation Program for which the above named laboratory maintains accreditation is outlined on the attached Scope of Accreditation. Continued accreditation is contingent upon successful on-going compliance with ISO/IEC 17025:2017 and AIHA-LAP, LLC requirements. This certificate is not valid without the attached Scope of Accreditation. Please review the AIHA-LAP, LLC website (www.aihaaccreditedlabs.org) for the most current Scope.

Cheryl O. Morton

Cheryl O. Morton
Managing Director, AIHA Laboratory Accreditation Programs, LLC

Revision 19: 09/01/2020

Date Issued: 09/01/2020

State of Connecticut, Department of Public Health

Approved Environmental Laboratory

THIS IS TO CERTIFY THAT THE LABORATORY DESCRIBED BELOW HAS BEEN APPROVED BY THE STATE DEPARTMENT OF PUBLIC HEALTH PURSUANT TO APPLICABLE PROVISIONS OF THE PUBLIC HEALTH CODE AND GENERAL STATUTES OF CONNECTICUT, FOR MAKING THE EXAMINATIONS, DETERMINATIONS OR TESTS SPECIFIED BELOW WHICH HAVE BEEN AUTHORIZED IN WRITING BY THAT DEPARTMENT.

CHEMSCOPE, INC

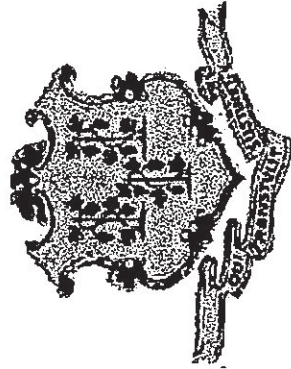
LOCATED AT 15 Moulthrop Street IN North Haven, Connecticut 06473
AND REGISTERED IN THE NAME OF DANIEL SULLIVAN

THIS CERTIFICATE IS ISSUED IN THE NAME OF SUZANNE CRISTANTE WHO HAS BEEN DESIGNATED BY THE REGISTERED OWNER AUTHORIZED AGENT TO BE IN CHARGE OF THE LABORATORY WORK COVERED BY THIS CERTIFICATE OF APPROVAL AS FOLLOWS:

BUILDING MATERIALS
ASBESTOS FIBERS - PCM
BULK IDENTIFICATION - PLM

SEE COMPUTER PRINT-OUT FOR SPECIFIC TESTS APPROVED

EFFECTIVE RENEWAL DATE April 1, 2021
THIS CERTIFICATE EXPIRES March 31, 2023 AND IS REVOCABLE FOR CAUSE BY THE STATE DEPARTMENT OF PUBLIC HEALTH
DATED AT HARTFORD, CONNECTICUT, THIS 15th DAY OF December, 2021



Lori D. Mathieu '21

Registration
No.

Lori Mathieu
Branch Chief

PH - 0581

Environmental Health & Drinking Water Branch

United States Department of Commerce
National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 101061-0

ChemScope, Inc.
North Haven, CT

is accredited by the National Voluntary Laboratory Accreditation Program for specific services,
listed on the Scope of Accreditation, for:

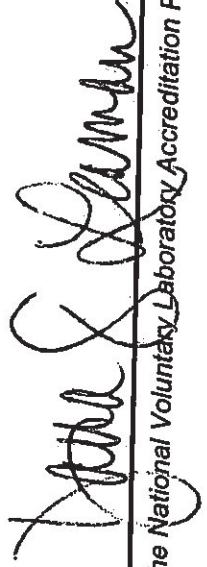
Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017.
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2021-04-01 through 2022-03-31

Effective Dates




For the National Voluntary Laboratory Accreditation Program

APPENDIX B

Dan Bombero Jr.
Dept of Public Works & Engineering
Town of Cheshire
84 South Main Street
Cheshire CT 06410

03/21/2022

**PRE-RENOVATION LEAD BASED PAINT XRF SCREENING
DOOLITTLE ELEMENTARY SCHOOL
735 CORNWALL AVENUE, CHESHIRE CT
CS# 206-277, 03/15/2022, PAGE 1 OF 5**

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Inspection Report Synopsis	4 - 5
Recommendations	5

- XRF Data Sheets (3 pages)
- Scope of Inspection Drawings (3 pages)
- XRF quality evaluation sheet (1 page)

Report Distribution:

rhaley@silverpetrucelli.com

dbombero@cheshirect.org

File Location:

NAS AAUM-Reports\LeadInsp\KD – XRF Survey 2022.doc

**PRE-RENOVATION LEAD BASED PAINT XRF SCREENING
DOOLITTLE ELEMENTARY SCHOOL
735 CORNWALL AVENUE, CHESHIRE CT
CS# 206-277, 03/15/2022, PAGE 2 OF 5**

INTRODUCTION

EXECUTIVE SUMMARY:

Lead-based paint (LBP), as defined by federal and Connecticut Department of Public Health (CT DPH) regulations, was **not** detected on any tested surfaces. All surfaces were below the limit of detection of the XRF and although not considered LBP (lead based paint) under most regulations, they may be subject to OSHA regulations which require personal air sampling under conditions of disturbance to detect potential traces of lead which may be present. See the XRF Testing Results section for a complete list of items tested.

SITE DESCRIPTION:

Doolittle Elementary School is a one-story building with a total area of about 47,720 SF and constructed of steel and masonry. Heat from the boilers is distributed through pipe chases up to heat units in room. There is a duct system above the drop ceilings throughout the building. The original building was constructed in 1962 totaling about 41,295 SF. In 1979 there was a 6,425 SF addition put on. In 1965 and 1975 there were 3 portable buildings added. There were major renovations in 1994 and 1995. The portable classrooms were eliminated. New additions were installed in 1995.

PURPOSE AND SCOPE OF INSPECTION:

Lead XRF Pre-Renovation Screening as directed by our client Ryan Haley of Cheshire Public Works. It is our understanding that you have plans to renovate and reconfigure bathrooms on the main floor and you would like Chem Scope to conduct lead-based paint testing prior to renovations. No other materials or areas were within the scope of this inspection. Please see attached Scope of Inspection Drawings for details.

QUALIFICATIONS:

The inspection was conducted by:

Kristina Dykes, CT DPH Certified DPH Lead Inspector #002242; Radiation Safety Training 5/8/2017.

Chem Scope's DPH lead license # is CC000164.

This investigation and information provided in this report depends partly on background information provided by the client. This report is intended for the use of the client. The scope of services performed may not be appropriate for other users and any use of this report by third parties is at their sole risk. This report is intended to be used in its entirety. No excerpts may be taken to be representative of this report.

**PRE-RENOVATION LEAD BASED PAINT XRF SCREENING
DOOLITTLE ELEMENTARY SCHOOL
735 CORNWALL AVENUE, CHESHIRE CT
CS# 206-277, 03/15/2022, PAGE 3 OF 5**

INTRODUCTION (CONT)

METHOD OF TESTING:

Spectrum Analyzer XRF (x-ray fluorescence). Instrument used: Viken PB200i, Serial # 2902. The unit source (Cobalt 57) for unit 2902 was installed February, 2021. The XRF detects paint in all layers down to the painted substrate. In other words, if lead paint is painted over with new paint, the lead paint is still detected by this procedure. When paint is covered with metal or plastic trim such as siding or by carpet, the lead paint is usually not detectable. This instrument is registered with the State of Connecticut Dept. of Energy and Environmental Protection and is Generally Licensed under the NRC. This is one of the two methods, which are approved under the CT Dept. of Public Health (DPH) regulations. This is a non-destructive test.

TEST PARAMETERS FOR XRF TESTING USING THIS INSTRUMENT:

XRF readings of 1.0 mg/cm² or higher are lead based paint.

XRF CALIBRATION CHECK:

Standard Reference Material (SRM) paint film nearest to 1.0 mg/cm² within the National Institute of Standards and Technology (NIST) SRM is used to Calibrate the XRF. Calibration Readings are taken at the beginning and end of a job and every two (2) hours during the job with three (3) readings per set. The expiration date of the standard used is 7/1/20.

QUALITY CONTROL PROCEDURES:

The XRF is used in accordance with Manufacturer's Performance Characteristics Sheet and instructions. See test data attached for details. Ten (or if <10, then the total number of tests conducted) testing combinations for re-testing from each unit are selected and checked in either 15 second or 60 second readings.

STATEMENT ON ACCURACY:

The XRF Calibration checks were acceptable with each of the three (3) readings before, during (if applicable) and after the testing between 0.7 mg/cm² and 1.3 mg/cm². See attached XRF data sheets for documentation of proper calibration check sequence.

REPORT CONVENTIONS:

Rooms and objects are sometimes given arbitrary numbers to avoid ambiguity. Please refer to the enclosed schematic drawings of the site. Tests are referenced by the side of the building they are facing as indicated on the drawings. Side A is the street side (front), Side B is the left side, Side C is the rear and Side D is the right side.

**PRE-RENOVATION LEAD BASED PAINT XRF SCREENING
DOOLITTLE ELEMENTARY SCHOOL
735 CORNWALL AVENUE, CHESHIRE CT
CS# 206-277, 03/15/2022, PAGE 4 OF 5**

INSPECTION REPORT SYNOPSIS

LOCATION NAME AND ADDRESS: Doolittle Elementary School
735 Cornwall Avenue, Cheshire CT

INSPECTION DATE(S): 03/15/2022

SITE OBSERVATIONS: On 03/15/2022, Kristina Dykes arrived on site and signed in at the office. Most surfaces were intact.

XRF Testing Results: *The following surface(s) and/or component(s) contained a toxic level of Lead based paint (at or above 1.0 mg/cm² as defined in CT DPH regulations 19a-111-1 through 11 and HUD guidelines as measured on site by an X-ray fluorescence analyzer):*

No Lead Based Paint Detected

The following surfaces contained less than 1.0 mg/cm² of lead, subject to OSHA regulations only:

Component/Description	Location	Defective?
Tan painted sheetrock wall	Girl's Bath and Boy's Bath	No
Green painted metal door casing	Girl's Bath	No
Green painted metal stalls	Girl's Bath	No
Tan painted cinder block wall	Boy's Bath	No
Green painted metal door stop	Boy's Bath	No
Green painted metal door frame	Teacher's	No
Yellow painted cinder block wall	Room 15 Bath	No
Red painted metal door stop	Room 15 Bath and Room 14 Bath	No
Red painted metal door frame	Room 15 Bath	Yes
White painted sheetrock ceiling	Room 15	No
White painted cinder block wall	Room 14	No
Green painted cinder block wall	Room 14 Closet	No

NOTES: OSHA CFR 29-1926.62: OSHA regulates any detectable amount of lead. Lead means metallic lead, all inorganic lead compounds, and organic lead soaps. Excluded from this definition are all other organic lead compounds. The XRF is not sensitive enough to prove lead is absent. OSHA requires assessment using personal air monitoring for lead while doing the actual disturbance or demolition of surfaces.

DEEP (EPA) also regulates lead in waste as a potential hazardous waste. DEEP recognizes XRF as a means to determine if a potential hazardous waste for lead is present. If we find (using XRF) that there is <100 mg of lead per kg of material, the material cannot be a hazardous lead waste. Also to be considered is if the material is going to be recycled or re-used, it is not a waste and therefore not regulated as such.

Nationally Accepted Definition: Lead-based paint means paint or other surface coatings that contain lead equal to or in excess of 1.0 milligram per square centimeter by XRF or 0.5 percent by weight by laboratory methods such as atomic absorption spectroscopy.

**PRE-RENOVATION LEAD BASED PAINT XRF SCREENING
DOOLITTLE ELEMENTARY SCHOOL
735 CORNWALL AVENUE, CHESHIRE CT
CS# 206-277, 03/15/2022, PAGE 5 OF 5**

INSPECTION REPORT SYNOPSIS (CONT):

The presence of damage to the coated surface is also important. The common term used in the industry is "defective."

Not all painted surfaces were tested. Consequently, if a surface was not tested assume it contains lead until proven otherwise. See attached data sheets for a list of surfaces tested.

Dust Wipe Sampling Results:

Not included as part of this work.

Soil Sampling Results:

Not included as part of this work.

Water Sampling Results:

Not included as part of this work.

RECOMMENDATIONS


Having XRF readings at 0 mg/cm² or less is still not, according to OSHA, an assurance that no lead is present, unless tested below the action level 30 micrograms/cubic meter by personal air sampling during the intended work. The components we tested should still be assumed to contain some lead, if even just trace amounts, and should be removed intact or as intact and practical and in ways that limit airborne levels of dust. OSHA worker protection regulations will apply. The following insert is taken directly from an OSHA standards interpretation letter. Copies of this letter can be forwarded by Chem Scope upon request.

The OSHA lead-in-construction standard (29 CFR 1926.62) was intended to apply to any detectable concentration of lead in paint, as even small concentrations of lead can result in unacceptable employee exposures depending upon on the method of removal and other workplace conditions. Since these conditions can vary greatly, the lead-in-construction standard was written to require exposure monitoring to ensure that employee exposures do not exceed the action level, by doing an assessment.

OSHA 1926.62 (worker protection): Work that disturbs surfaces or components that contain lead must be done according to OSHA regulation 1926.62. Each employer who has an operation covered by 1926.62 shall initially determine if any employee may be exposed to lead at or above the Action Level (AL) and must make sure that employees are not exposed above the Permissible Exposure Limit (PEL). Currently, the AL is set at 30 micrograms of lead per cubic meter of air ($\mu\text{g}/\text{m}^3$) and the PEL is 50 $\mu\text{g}/\text{m}^3$. At a minimum the following is required of employers whose employees are handling lead or are in the area where lead is being disturbed:

1. Train employees to the dangers of lead and to lead safe work practices including proper hygiene practices
2. Maintain Records
3. Conduct personal air sampling while doing work. Follow the OSHA regulations in 1926.62 if either the OSHA Permissible Exposure Limit (PEL) for lead (50 $\mu\text{g}/\text{m}^3$ averaged over an 8-hour period) or the Action Level for lead (30 $\mu\text{g}/\text{m}^3$ averaged over an 8-hour period) are exceeded.

Sincerely,


Kristina Dykes
Lead inspector

Site Name: Doolittle Elementary School Date of Inspection: 3/15/22

Site Address: 735 Cornwall Avenue, Cheshire, CT CS# 206-277

Customer Name: Daniel Bombero Jr. -

Customer Address: 84 South Main Street , Cheshire CT 06410

Work Area: Boy's Handicap Bathroom Next to 157, Girl's Bathroom 157, Teacher's Bathroom Next to Page 1 of 3

Site Description: _____ Year of Construction: 1962

Name of Individual Doing Testing: Kristina Dykes CT DPH Lic# 002242

CO-57 Date Source Installed: Feb. 2021 Software version # N/A Serial # 2902

Test #	Clock Time	NIST Calibration Standard	Results QM (mg/CM2)
1	2:38	NIST SRM 2573 Red	1.1
2	2:38	NIST SRM 2573 Red	1.1
3	2:39	NIST SRM 2573 Red	1.0
A8	3:27	NIST SRM 2573 Red	1.0
49	3:27	NIST SRM 2573 Red	1.0
50	3:28	NIST SRM 2573 Red	1.0
		NIST SRM 2573 Red	
		NIST SRM 2573 Red	
		NIST SRM 2573 Red	
4	2:39	NIST SRM 2570 White (Blank)	0.0
51	3:28	NIST SRM 2570 White (Blank)	0.0

Note: each entry represents a single test on the surface indicated.

- Acceptance limits for calibration are 0.7-1.3.
- 1.0 mg/cm² or higher = lead based paint (LBP)
- All values run under Quick Mode (QM), unless noted otherwise under comments above.
- Calibration std SRM 2573 has 1.0 mg/cm² of lead, expiration of std is 7/1/20.
- DEF under comments means the surface has defective lead based paint

INSPECTOR SIGNATURE/Date/REVIEWED BY/Date: Kristina Dykes 3/15/22 Don Allen 3/23/2022

Site Name: **Doolittle Elementary School**

Date of Inspection: 3/15/22

Site Address: **735 Cornwall Avenue, Cheshire, CT**

CS# 206-277

Work Area: **Boy's Handicap Bathroom Next to 157, Girl's Bathroom 157, Teacher's Bathroom**

Page 2 of 3

Test #/ Side	Int/Ext	Room #	Component	Defective (Y/N)	Color	Substrate	Results QM (mg/CM2)	LBP (Y/N)		
5	C	Int.	Girls	wall	N	tan	SF	0.1	N	
6	"	"	"	"	"	"	"	0.1	N	QC
7	A	"	"	wall	N	"	CB	0.0	N	
8	"	"	"	"	"	"	"	0.0	N	QC
9	B	"	"	door case	N	green	metal	0.4	N	
10	"	"	"	"	"	"	"	0.4	N	QC
11	D	"	"	door	N	stained	wood	0.0	N	
12	"	"	"	"	"	"	"	0.0	N	QC
13	D	"	"	door stop	N	green	metal	0.0	N	
14	"	"	"	"	"	"	"	0.0	N	QC
15	C	"	"	wall	N	tan	CB	0.0	N	
16	"	"	"	"	"	"	"	0.0	N	QC
17	B	"	"	wall	N	"	SF	0.0	N	
18	"	"	"	"	"	"	"	0.0	N	QC
19	D	"	"	stalls	N	green	metal	0.1	N	
20	"	"	"	"	"	"	"	0.0	N	QC
21	C	"	"	radiator	N	tan	"	0.0	N	
22	"	"	"	"	"	"	"	0.0	N	QC
23	C	"	Boys	wall	N	"	CB	0.4	N	
24	"	"	"	"	"	"	"	0.0	N	QC
25	B	"	"	door stop	N	green	metal	0.5	N	
26	D	"	"	door	N	stained	wood	0.0	N	
27	B	"	"	wall	N	tan	SF	0.1	N	
28	D	"	"	stall	N	"	metal	0.0	N	
29	A	"	"	radiator	N	"	"	0.0	N	
30	B	"	Teach	door frame	N	green	metal	0.6	N	
31	A	"	"	wall	N	tan	SF	0.0	N	
32	B	"	"	door	N	stained	wood	0.0	N	
33	A	"	"	ceiling	N	white	SCT	0.0	N	

Signature: Kristina Pyle

Date: 3/15/22

Site Name: **Doolittle Elementary School**

Date of Inspection: 3/15/07

Site Address: **735 Cornwall Avenue, Cheshire, CT**

CS# 206-277

Work Area: **Boy's Handicap Bathroom Next to 157, Girl's Bathroom 157, Teacher's Bathroom**

Page 3 of 3

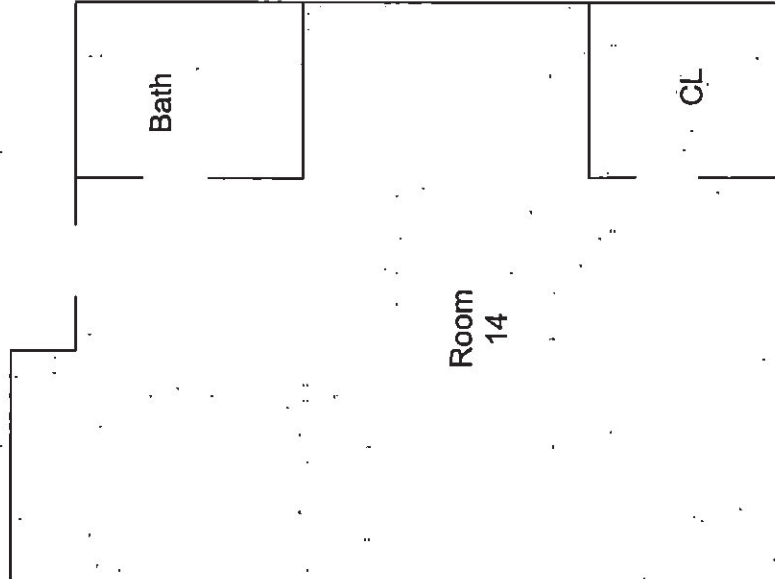
Test # / Side	Int/Ext	Room #	Component	Defective (Y/N)	Color	Substrate	Results QM (mg/CM2)	LBP (Y/N)
34 A	Int.	15 B	wall	N	white	CB	0.0	N
35 A	"	"	wall	N	yellow	CB	0.0	N
36 C	"	"	door stop	N	red	metal	0.0	N
37 C	"	"	door frame	Y	"	"	0.6	N
38 A	"	15	wall	N	tan	CB	0.0	N
39 A	"	"	wall	N	"	"	0.0	N
40 A	"	"	ceiling	N	white	SR	0.1	N
41 D	"	15CL	wall	N	blue	CB	0.0	N
42 A	"	14B	wall	N	white	CB	0.0	N
43 A	"	"	wall	N	green	"	0.0	N
44 C	"	"	door stop	N	red	metal	0.4	N
45 C	"	"	door	N	stained	wood	0.0	N
46 A	"	14	wall	N	white	CB	0.3	N
47 B	"	14CL	wall	N	green	"	0.4	N

Signature: Kristina Pyle

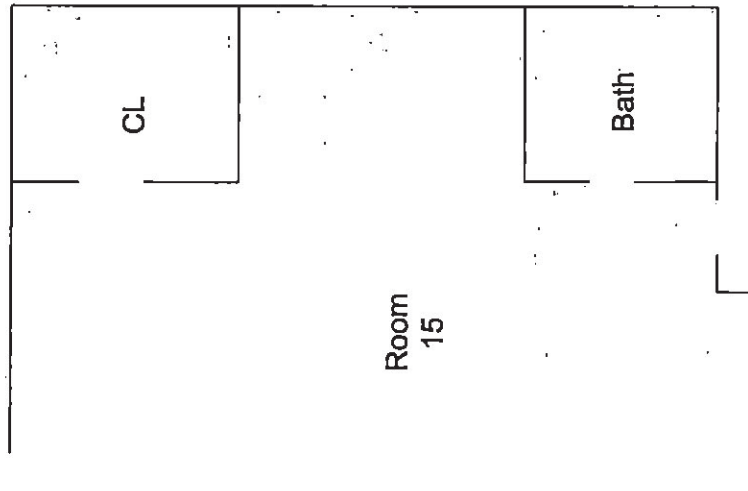
Date: 3/15/07

Chem Scope Inc.
Pre-Renovation XRF Screening
Doolittle Elementary School
735 Cornwall Avenue, Cheshire CT
CS# 206-277 03-15-2022

SIDE C



SIDE D



SIDE B

SCHEDULE	
RECORD OF STUDIES	
ROTATIONS	
TOTAL SQUARE FEET	
DATE BY	
ChemScope Inc.	
DATE BY	
PLAN	
NOT TO SCALE	
DATE	

Site Name: Doolittle Elementary School					CS#206-277
Site Address: 375 Cornwall Avenue, Cheshire CT					Date: 03/15/2022
	Location	Original Reading	Retest Reading	Square of Original Reading	Square of Retest Reading
1.	Interior - Girl's - Wall - Side C	0.1	0.1	0.01	0.01
2.	Interior - Girl's - Wall - Side A	0.0	0.0	0.00	0.00
3.	Interior - Girl's - Door Case - Side B	0.4	0.4	0.16	0.16
4.	Interior - Girl's - Door - Side D	0.0	0.0	0.00	0.00
5.	Interior - Girl's - Door Stop - Side D	0.0	0.0	0.00	0.00
6.	Interior - Girl's - Wall - Side C	0.0	0.0	0.00	0.00
7.	Interior - Girl's - Wall - Side B	0.0	0.0	0.00	0.00
8.	Interior - Girl's - Stalls - Side D	0.1	0.0	0.01	0.00
9.	Interior - Girl's - Radiator - Side C	0.0	0.0	0.00	0.00
10.	Interior - Boy's - Wall - Side C	0.4	0.0	0.16	0.00
	Sum of ten squared averages ("C"):			0.34	0.17
			"C" times 0.0072 ("D"):	0.002448	0.00122
			"D" plus 0.032 ("E"):	0.034448	0.033224
			Square root of "E" ("F"):	0.18560	0.182274518
			"F" times 1.645 (Retest Tolerance Limit):	0.3053	0.2998
	Average of the ten XRF Readings:			0.10	0.05
			Absolute difference of the two averages:	0.0500	
	If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest.				

APPENDIX C

STATE OF CONNECTICUT

DEPARTMENT OF PUBLIC HEALTH

PURSUANT TO THE PROVISIONS OF THE GENERAL STATUTES OF CONNECTICUT

THE INDIVIDUAL NAMED BELOW IS CERTIFIED
BY THIS DEPARTMENT AS A

ASBESTOS CONSULTANT-PROJECT DESIGNER

NATHAN R YERGEAU

CERTIFICATE NO.

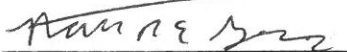
000288

CURRENT THROUGH

09/30/22

VALIDATION NO.

03-911519


SIGNATURE


ACTING COMMISSIONER

CERT#: PD-001-Virtual.554

**CHEMSCOPE TRAINING DIVISION
ASBESTOS PROJECT DESIGNER REFRESHER
8-HOUR TRAINING CERTIFICATE**

Nathan Yergeau

15 Moulthrop Street, North Haven CT

Has attended an 8-hour annual refresher course on the subject discipline on
01/10/2022 and has passed a written examination.

"The person receiving this certificate has completed the requisite training required for asbestos accreditation as a project designer under TSCA Title II"
Course topics include Background Information on Asbestos, Abatement Construction Projects, Safety System Design Specifications, Personal Protective Equipment, Additional Safety Hazards, Fiber Aerodynamics and Control and Designing.

This training course has been accredited by the State of Connecticut.

Examination Score: 97%
Exam Date: 01/10/2022
Expiration Date: 01/10/2023



Daniel Sullivan
Training Manager

Chem Scope, Inc.
15 Moulthrop Street
North Haven CT 06473
Phone: 203.865.5605
www.chem-scope.com

SECTION 024119 - SELECTIVE DEMOLITION

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. Demolition and removal of selected portions of building or structure.
- 2. Salvage of existing items to be reused or recycled.

B. Related Requirements:

- 1. Section 011000 "Summary of Work" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
- 2. Section 017300 "Execution" for cutting and patching procedures.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Remove and Replace: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled. Provide and install new items as specified.
- E. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- F. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

- A. Pre-demolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and for noise control. Indicate proposed locations and construction of barriers.

- B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's and other tenants' on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

- C. Pre-demolition Photographs: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.

- D. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is included elsewhere in the Contract Documents for review and use. Examine report to become aware of locations where hazardous materials are present.
 - 1. Hazardous material remediation is specified elsewhere in the Contract Documents.
 - 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
 - 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

- D. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs or video.
 - 1. Comply with requirements specified in Section 013233 "Photographic Documentation."
 - 2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 - 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
 - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.3 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

B. Remove temporary barricades and protections where hazards no longer exist.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. All removed materials and rubbish shall be constantly sprinkled with water or other dusting agent to mitigate dust. Provide drop cloths or other type of coverings to prevent infiltration of dust to other parts of the existing building.
10. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.

4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- C. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
 1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn demolished materials.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one (1) or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, manufacturer, and testing agency.
- B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Steel reinforcement and accessories.
 - 4. Curing compounds.
 - 5. Floor and slab treatments.
 - 6. Bonding agents.
 - 7. Adhesives.

8. Semi-rigid joint filler.
9. Joint-filler strips.
10. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency:

1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

E. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field-Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1.8 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three (3) successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064, plain, fabricated from as-drawn steel wire into flat sheets.
- C. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064, flat sheet.

2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

- B. Cementitious Materials:
1. Portland Cement: ASTM C 150, Type I/II, gray.
 2. Fly Ash: ASTM C 618, Class F.
- C. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least ten (10) years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
1. Maximum Coarse-Aggregate Size: $\frac{3}{4}$ -inch nominal.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494, Type A.
 2. Retarding Admixture: ASTM C 494, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.
- F. Moisture Vapor Reducing Admixture (MVRA): Concrete moisture vapor reduction admixture for all interior slab (on ground and elevated) construction shall be a non-toxic, liquid admixture that is specifically designed to have a natural chemical reaction with pre-existing elements inside the concrete to eliminate the route of moisture vapor emission through the slab by restricting the integral capillary system. The chemical reaction forms a permanent barrier (capillary break) that is integral to the concrete, insoluble and irremovable.
1. Basis-of-Design Product:
 - a. Barrier One, Inc.; **Barrier One High Performance Concrete Admixture**
 2. 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. Construction Specialties Group
 - b. Moxie International
 - c. Vapor Lock 20/20
 - d. Substitutions: Under provisions of Section 012500 "Substitution Procedures".
 3. Project specific quality control process to include but not limited to:
 - a. Independent procurement of one (1) cylinder per day of placement of concrete containing MVRA; do not proceed without MVRA representative being present.
 - b. Independent testing of all cylinders for hydraulic conductivity per ASTM D 5084.

- c. Assessing each cylinder for maximum flow of 6.0 E-08 cm/sec.
 - d. Should any cylinder exceed the maximum flow, procure a core from that day's placement.
 - e. Independently test core for hydraulic conductivity per ASTM D 5084.
 - f. Should any core exceed the maximum flow, provide a topical moisture mitigation system for all areas not meeting the stated limit; moisture mitigation system to include all labor, material and warranty that meets or exceeds the terms of the concrete moisture vapor reduction admixture manufacturer's warranty.
4. Warranty Requirements: Said product must be installed according to and in compliance with the manufacturer's published data sheet to include but not limited to dosing instructions, onsite representation requirements, installed following ASTM E 1643 and ASTM F 710 guidelines.
- a. MVRA Manufacturer's warranty shall include:
 - 1) Term: Life of the concrete.
 - 2) Repair and/or removal of failed flooring.
 - 3) Placement of a topical moisture remediation system.
 - 4) Replacement of flooring materials like original installed to include material and labor.
 - b. MVRA Manufacturer shall provide an adhesion warranty to match the term of the adhesive manufacturer's warranty in accordance with the MVRA manufacturer's requirements for conveyance of such.
5. Properties:
- a. Water Vapor Transmission: 0.20 US perms per ASTM D 5084.
 - b. Appearance: Colorless.
 - c. Odor: None.
 - d. Toxicity: None.
 - e. Flammability: None.
 - f. Ph: 11.3.
 - g. Shelf Life: Indefinite.
 - h. Weight: 11.2 lbs per gallon.
 - i. Freeze Temp: 32°F.
 - j. Storage Temp: Above 36°F.
 - k. Solvent: Water.
 - l. Acid Resistance: Excellent.
 - m. Hazardous Vapors: None.
 - n. Capillary Break: Calcium Silicate Hydrate.
 - o. Installation: All slabs-on-grade.
 - p. VOC Levels: Zero.

G. Water: ASTM C 94 and potable.

2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, non-dissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Construction Chemicals - Building Systems; **Kure-N-Seal WB**
 - b. ChemMasters; **Safe-Cure & Seal 20**
 - c. Dayton Superior Corporation; **Safe Cure and Seal (J-18)**
 - d. Euclid Chemical Company (The), an RPM company; Aqua Cure VOX; **Clearseal WB 150**
 - e. Meadows, W. R., Inc.; **Vocomp-20**
 - f. Vexcon Chemicals, Inc.; **Starseal 309**
 - g. Substitutions: Under provisions of Section 012500 "Substitution Procedures".

2.6 RELATED MATERIALS

- A. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- B. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034-inch-thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.7 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash: Twenty-five percent (25%).
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use high-range water-reducing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.
4. Use waterproofing admixture in accordance with manufacturer's recommendations in all ready-mix concrete to be placed in interior slabs-on-grade.
 - a. A representative or agent must be present at the jobsite during the placement of treated concrete. Do not proceed without the representative being present for the certification of the mix and placement process. Provide minimum ten (10) days' notice of the placement of the first batch of treated concrete.
 - b. Dispense at a rate of per 100 lbs. of cementitious materials per the manufacturer's recommendations at the tail end of the load, dose to be within plus or minus three percent (+/- 3%). Additional dosage may be required based on the mix design.
 - 1) Add admixture to ready mix concrete truck, in the require dosage, and mix for 7 minutes before discharge. Moisture vapor reducing admixture is to be used in lieu of designed mix water, not in addition to mix water.
 - 2) Do not alter 0.45 water/cementitious materials ratio without prior approval.
 - 3) The addition of non-chlorinated admixtures is permitted.
 - c. Other admixtures may be used in the same concrete batch with moisture vapor reducing admixture provided that such admixtures are added separately.
 - 1) The water-to-cementitious material ratio (w/cm) is critical, and it is imperative to comply with the mix design. Moisture vapor reducing admixture is used in lieu of that portion of the mix water, not in addition to the mix water.
 - 2) Use of plasticizers or water reducers is recommended to achieve slumps greater than 4 inches.

2.8 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Slabs-on-Grade: Normal-weight concrete.

1. Minimum Compressive Strength: 4000 psi at twenty-eight (28) days.
2. Minimum Cementitious Materials Content: 540 lb/cu. yd.
3. Slump Limit: 4 inches, plus or minus 1-inch.
4. Air Content: Do not allow air content of trowel-finished floors to exceed three percent (3%).
5. Provide moisture vapor reducing admixture in the concrete mix. Dosage rate shall be in accordance with the manufacturer's recommendations.

2.9 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1½ hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 2. Install dovetail anchor slots in concrete structures as indicated.

3.2 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 1. Weld reinforcing bars according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one (1) mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.3 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 2. Form keyed joints as indicated. Embed keys at least 1½ inches into concrete.
 3. Locate joints for slabs in the middle third of spans.
 4. Locate horizontal joints in walls at underside of floors and slabs and at the top of footings or floor slabs.

5. Space vertical joints in walls 50 feet o.c. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Control Joints in Slabs-on-Grade: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth (1/4) of concrete thickness as follows:
1. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random control cracks.
- D. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one (1) side of joint.

3.4 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.5 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.
 1. Apply float finish to surfaces to receive trowel finish.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 1. Apply a trowel finish to surfaces exposed to view.
 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
 3. Finish and measure surface, so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.-long straightedge resting on two high spots and placed anywhere on the surface does not exceed $\frac{1}{4}$ inch.

3.6 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

3.7 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

- C. Cure concrete according to ACI 308.1, by one (1) or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven (7) days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven (7) days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

3.8 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
1. Defer joint filling until concrete has aged at least six (6) months. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semi-rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.9 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one (1) part Portland cement to two and one-half (2½) parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01-inch-wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least fourteen (14) days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - 5. Repair defective areas, except random cracks and single holes 1-inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a ¾-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 - 6. Repair random cracks and single holes 1-inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- D. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.10 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
 - 1. Headed bolts and studs.
 - 2. Verification of use of required design mixture.
 - 3. Concrete placement, including conveying and depositing.
 - 4. Curing procedures and maintenance of curing temperature.
 - 5. Verification of concrete strength before removal of shores and forms from beams and slabs.

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- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain at least one (1) composite sample for each 100-cu. yd. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing provides fewer than five (5) compressive-strength tests for each concrete mixture, testing shall be conducted from at least five (5) randomly selected batches or from each batch if fewer than five (5) are used.
 2. Slump: ASTM C 143; one (1) test at point of placement for each composite sample, but not less than one (1) test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one (1) test for each composite sample, but not less than one (1) test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C 1064; one (1) test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one (1) test for each composite sample.
 5. Compression Test Specimens: ASTM C 31.
 - a. Cast and field cure four (4) sets of two (2) standard cylinder specimens for each composite sample.
 6. Compressive-Strength Tests: ASTM C 39.
 - a. Test one (1) set of two (2) field-cured specimens at seven (7) days and one (1) set of two (2) specimens at twenty-eight (28) days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two (2) specimens obtained from same composite sample and tested at age indicated.
 7. When strength of field-cured cylinders is less than eighty-five percent (85%) of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 8. Strength of each concrete mixture will be satisfactory if every average of any three (3) consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at twenty-eight (28) days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency

may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

- D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

END OF SECTION 033000

SECTION 042200 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Mortar and grout.
 - 3. Steel reinforcing bars.
 - 4. Masonry-joint reinforcement.
 - 5. Miscellaneous masonry accessories.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - 2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - 2. Cementitious materials. Include name of manufacturer, brand name, and type.

3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 4. Grout mixes. Include description of type and proportions of ingredients.
 5. Reinforcing bars.
 6. Joint reinforcement.
 7. Anchors, ties, and metal accessories.
- C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109 for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- D. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained, and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.

- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three (3) days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

2.3 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide bullnose units for outside corners unless otherwise indicated.

B. CMUs: ASTM C 90.

1. Density Classification: Normal weight.
2. Size (Width): Manufactured to dimensions 3/8-inch less-than-nominal dimensions.

2.4 MASONRY LINTELS

- A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.5 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4-inch-thick, use aggregate graded with one hundred percent (100%) passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

D. Aggregate for Grout: ASTM C 404.

E. Water: Potable.

2.6 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615 or ASTM A 996, Grade 60.

B. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A 951.

1. Interior Walls: Hot-dip galvanized carbon steel.
2. Wire Size for Side Rods: 0.148-inch diameter.
3. Wire Size for Cross Rods: 0.148-inch diameter.
4. Spacing of Cross Rods: Not more than 16 inches o.c.
5. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

2.7 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1½ inches into masonry but with at least a 5/8-inch cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 - 1. Stainless-Steel Wire: ASTM A 580, Type 304.
 - 2. Stainless-Steel Sheet: ASTM A 240 or ASTM A 666, Type 304.
- C. Partition Top Anchors: 0.105-inch-thick metal plate with a 3/8-inch-diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from stainless steel.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to thirty-five percent (35%); of width and thickness indicated; formulated from closed cell PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

2.9 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use Portland cement-lime mortar unless otherwise indicated.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated.
 - 1. For reinforced masonry, use Type S.
 - 2. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
 - 3. For interior non-load-bearing partitions, Type O may be used instead of Type N.

- D. Grout for Unit Masonry: Comply with ASTM C 476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C 476, Table 1.
 - 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
 - 4. Verify that substrates are free of substances that would impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Build chases and recesses to accommodate items specified in this and other Sections.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation, do not vary by more than plus ½-inch or minus ¼-inch.
 - 2. For location of elements in plan, do not vary from that indicated by more than plus or minus ½-inch.
 - 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus ¼-inch in a story height or ½-inch total.
- B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than ¼-inch in 10 feet, or ½-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8-inch in 10 feet, ¼-inch in 20 feet, or ½-inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than ¼-inch in 10 feet, 3/8-inch in 20 feet, or ½-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8-inch in 10 feet, ¼-inch in 20 feet, or ½-inch maximum.
5. For lines and surfaces do not vary from straight by more than ¼-inch in 10 feet, 3/8-inch in 20 feet, or ½-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than ¼-inch in 10 feet, or ½-inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8-inch, with a maximum thickness limited to ½-inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8-inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8-inch or minus ¼-inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8-inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8-inch.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide ½-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
 - 3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.6 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8-inch on exterior side of walls, ½-inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

- E. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry as follows:
 - 1. Install preformed control-joint gaskets designed to fit standard sash block.

3.8 LINTELS

- A. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
- B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.9 REINFORCED UNIT MASONRY INSTALLATION

- A. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- B. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches.

3.10 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to Level C in TMS 402/ACI 530/ASCE 5.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Frequency: One (1) set of tests for each 5000-sq. ft. of wall area or portion thereof.
- D. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

- E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- F. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.
- G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.11 CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.12 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042200

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Wood blocking and nailers.

1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NLGA: National Lumber Grades Authority.
 - 3. WCLIB: West Coast Lumber Inspection Bureau.
 - 4. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 2. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 - 3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 - 1. Fire-retardant-treated wood.
 - 2. Power-driven fasteners.

3. Post-installed anchors.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 1. Factory mark each piece of lumber with grade stamp of grading agency.
- B. Maximum Moisture Content of Lumber: Fifteen percent (15%) unless otherwise indicated.

2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, 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 beyond the centerline of the burners at any time during the test.
 1. Treatment shall not promote corrosion of metal fasteners.
 2. 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 all locations and where indicated.
 3. 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. 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.

- C. Kiln-dry lumber and plywood after treatment to a maximum moisture content of fifteen percent (15%).
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. Application: Treat **all** rough carpentry unless otherwise indicated.

2.3 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Grounds.
- B. Dimension Lumber Items: Standard, Stud, or No. 3 grade lumber of any of the following species:
 - 1. Hem-fir (north); NLGA.
 - 2. Hem-fir; WCLIB or WWPA.
 - 3. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
- C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.4 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless-steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 or ICC-ES AC193 as appropriate for the substrate.
 - 1. Material: Stainless-steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- C. Do not splice structural members between supports unless otherwise indicated.
- D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- E. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- F. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use copper naphthenate for items not continuously protected from liquid water.
- G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
 - 2. ICC-ES evaluation report for fastener.
- H. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

END OF SECTION 061000

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Fireproof firestopping and firesafing materials and accessories.

1.3 PERFORMANCE REQUIREMENTS

- A. Fireproofing Materials: ASTM E 119 and ASTM E 814 to achieve a fire rating as noted on Drawings.
- B. Surface Burning: ASTM E 84 with a flame spread/fuel contributed/smoke developed rating of 5/0/0.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated provide characteristics, performance, and limitation criteria.
- B. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three (3) years documented experience.
- B. Applicator: Company specializing in performing the work of this Section with minimum five (5) years documented experience.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable State Building code for fire resistance ratings and surface burning characteristics.
- B. UL Classifications for these systems shall be (all two (2) hours or more):
 - 1. Duct Penetrations: C-AJ-7027
 - 2. Pipe Penetrations: C-AJ-1079
 - 3. Cable Penetrations: C-AJ-1079

4. Conduit Penetrations: C-AJ-1079

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when temperature of substrate material and ambient air is below 60 degrees F.
- B. Maintain this minimum temperature before, during and for three (3) days after installation of materials.
- C. Provide ventilation in areas to receive solvent cured materials.

1.8 SEQUENCING

- A. Sequence Work to permit firestopping materials to be installed after adjacent and surrounding work is complete.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Thermal Ceramics; **Firemaster Putty, Bulk and Blankets**
- B. Tremco Incorporated; **Fyre-shield and Cerablanket FS Hilti, Inc.**
- C. United States Gypsum; **Thermafiber Safing Insulation and FIRECODE compound**
- D. Substitutions: Under provisions of Section 012500 "Substitution Procedures".

2.2 MATERIALS

- A. Firestopping Material: Single component silicone elastomeric compounds; conforming to the following:
 - 1. Elongation & Shrinkage: Five percent (5%).
 - 2. Tensile Strength: 300 psi.
 - 3. Density: 8 lb/cu ft.
 - 4. Surface Durability: 35 (Shore Hardness).
 - 5. Durability and Longevity: Permanent.
 - 6. Side Effects during Installation: Non-toxic.
 - 7. Long Term Side Effects: None.
- B. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.
- C. Firesafing Blankets: ASTM C 665; 4 psf nominal density firesafing insulation.
- D. Putty Pads: UL CLIV; acoustic, intumescent pad; 3.2mm thickness.

2.3 ACCESSORIES

- A. Dam Material: Mineral fiber matting, permanent.

- B. Retainers: Stainless clips to support mineral fiber matting

2.4 FINISHES

- A. Color: Dark gray or manufacturer's standard color.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.
- B. Install backing materials to arrest liquid material leakage.

3.3 INSTALLATION

- A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Apply firestopping material to all wall and floor penetrations through rated assemblies. These penetrations include electrical conduit and raceways, plumbing and heating system penetrations, ducts, and other system chases.
- C. Apply primer and materials in accordance with manufacturer's instructions.
- D. Apply firestopping material in sufficient thickness to achieve rating to a density of fifty percent (50%) to uniform density and texture.
- E. Install material at walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit, and other items requiring firestopping.
- F. Remove dam material after firestopping material has cured.

3.4 CLEANING AND PROTECTION

- A. Clean off excess materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.5 SCHEDULE

- A. See Construction Documents for rating information and construction details and conditions.
- B. Firesafe all penetrations through new and existing masonry and gypsum board construction in the project work areas, equal to the one (1) or two (2) hour rating of the appropriate spaces.

END OF SECTION 078413

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Silicone joint sealants.
 - 2. Latex joint sealants.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
- D. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.6 PROJECT CONDITIONS

- A. 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 or are below 40 deg F (5 deg C).
 2. When joint substrates are wet.
 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: Two (2) years from date of Substantial Completion.
- B. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 3. Mechanical damage caused by individuals, tools, or other outside agents.
 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:
 1. Architectural sealants shall have a VOC content of 250 g/L or less.
- C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

- D. Stain-Test-Response Characteristics: Where sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- E. Colors of Exposed Joint Sealants: As selected by Architect and Owner from manufacturer's entire range, to match adjacent where required.

2.2 SILICONE JOINT SEALANTS

- A. Mildew-Resistant, Single-Component, Non-sag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pecora Corporation; **898**
 - b. Substitutions: Under provisions of Section 012500 "Substitution Procedures".

2.3 LATEX JOINT SEALANTS

- A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Building Systems; **Sonolac**
 - b. Bostik, Inc.; **Chem-Calk 600**
 - c. Pecora Corporation; **AC-20+**
 - d. Tremco Incorporated; **Tremflex 834**
 - e. Substitutions: Under provisions of Section 012500 "Substitution Procedures".

2.4 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type B (bi-cellular material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Non-Sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
 - 4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
 - 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces.

- 1. Joint Locations:

- a. Control and expansion joints on exposed interior surfaces of exterior walls.
- b. Perimeter joints of exterior openings where indicated.
- c. Vertical joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
- d. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
- e. Other joints as indicated.

- 2. Joint Sealant: Latex.

- B. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic surfaces.

- 1. Joint Sealant Location:

- a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
- b. Other joints as indicated.

- 2. Joint Sealant: Mildew resistant, single component, non-sag, neutral curing, silicone.

END OF SECTION 079200

SECTION 081213 - HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes hollow-metal frames.
- B. Related Requirements:
 - 1. Section 081416 "Flush Wood Doors" for wood doors installed in hollow-metal frames.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each frame type.
 - 2. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 3. Locations of reinforcement and preparations for hardware.
 - 4. Details of each different wall opening condition.
 - 5. Details of anchorages, joints, field splices, and connections.
 - 6. Details of accessories.
- C. Samples: Prepare Samples approximately 12 by 12 inches to demonstrate compliance with requirements for quality of materials and construction. Show profile, corner joint, floor and wall anchors, and silencers.

- D. Product Schedule: For hollow-metal frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two (2) removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal frames vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum ¼-inch space between each unit to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design:
 - 1. Steelcraft; an Allegion company
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Ceco Door Products; an ASSA ABLOY Group company
 - 2. Curries Company; an ASSA ABLOY Group company
 - 3. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.
- C. Source Limitations: Obtain hollow-metal frames from single source from single manufacturer.

2.2 STANDARD STEEL FRAMES

- A. Construct interior frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Interior Frames: SDI A250.8, Level 3.
 - 1. Physical Performance: Level A according to SDI A250.4.
 - 2. Materials: Uncoated steel sheet, minimum thickness of 0.053-inch.
 - 3. Construction: Full profile welded.
 - 4. Exposed Finish: Prime.

2.3 FRAME ANCHORS

- A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
2. Quantity: Minimum of three (3) anchors per jamb, with one (1) additional anchor for frames with no floor anchor. Provide one (1) additional anchor for each 24 inches of frame height above 7 feet.
3. Post-installed Expansion Anchor: Minimum 3/8-inch-diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor:

C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.

2.4 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Frame Anchors: ASTM A 879, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

C. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153.

D. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

E. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143.

F. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.5 FABRICATION

A. Fabricate hollow-metal frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Frames: Fabricate in one (1) piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.

1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
2. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.

3. Floor Anchors: Weld anchors to bottoms of jambs with at least four (4) spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
4. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

- a. Single-Door Frames: Drill stop in strike jamb to receive three (3) door silencers.

C. Hardware Preparation: Factory prepare hollow-metal frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce frames to receive non-templated, mortised, and surface-mounted hardware.
2. Comply with BHMA A156.115 for preparation of hollow-metal frames for hardware.

2.6 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.7 ACCESSORIES

A. Grout Guards: Formed from same material as frames, not less than 0.016-inch-thick.

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 embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap frames to receive non-templated, mortised, and surface-mounted hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions. Comply with SDI A250.11.
- B. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - 1. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - 2. Install door silencers in frames before grouting.
 - 3. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - 4. Field apply bituminous coating to backs of frames that will be filled with grout containing anti-freezing agents.
- C. Floor Anchors: Secure with post-installed expansion anchors.
 - 1. Floor anchors may be set with power-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.
- D. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
- E. In-Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
- F. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
 - 1. Squareness: Plus or minus 1/16-inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16-inch, measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16-inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus or minus 1/16-inch, measured at jambs at floor.

3.4 CLEANING AND TOUCH-UP

- A. Remove grout and other bonding material from hollow-metal work immediately after installation.
- B. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION 081213

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid-core doors with wood-veneer faces.
 - 2. Factory finishing flush wood doors.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
 - 1. Dimensions and locations of blocking for hardware attachment.
 - 2. Dimensions and locations of mortises and holes for hardware.
 - 3. Dimensions and locations of cutouts.
 - 4. Clearances and undercuts.
 - 5. Requirements for veneer matching.
 - 6. Doors to be factory finished and finish requirements.
- C. Samples:
 - 1. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
 - a. Provide Samples for each species of veneer and solid lumber required.
 - b. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.

- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Delamination of veneer.
 - b. Warping (bow, cup, or twist) more than ¼-inch in a 42-by-84-inch section.
 - c. Telegraphing of core construction in face veneers exceeding 0.01-inch in a 3-inch span.
 - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Manhattan Door Corp.
 - 2. Masonite Architectural Company
 - 3. VT Industries, Inc.
 - 4. Substitutions: Under provisions of Section 012500 "Substitution Procedures".
- B. Source Limitations: Obtain flush wood doors and transom panels from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Standards."
- B. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors:

1. Grade: **Premium**, with Grade AA faces.
2. Faces: Single-ply wood veneer not less than 1/50-inch-thick.
 - a. Species: Select clear maple as a minimum, but to match existing.
 - b. Cut: Rotary cut as minimum, but to match existing.
 - c. Match between Veneer Leaves: Book match.
 - d. Assembly of Veneer Leaves on Door Faces: Balance match.
 - e. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 10 feet or more.
3. Exposed Vertical and Top Edges: Same species as faces - edge Type A.
4. Core for Non-Fire-Rated Doors:
 - a. ANSI A208.1, Grade LD-2 particleboard.
 - 1) Blocking: Provide wood blocking in particleboard-core doors as follows:
 - a) 5-inch top-rail blocking, in doors indicated to have closers.
 - b) 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
5. Construction: Five (5) or seven (7) plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.4 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated.
 1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
- B. Factory machine doors for hardware that is not surface applied.
 1. Locate hardware to comply with DHI-WDHS-3.
 2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
 3. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

2.5 FACTORY FINISHING

- A. Comply with referenced quality standard for factory finishing.
 1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 2. Finish faces, all four (4) edges, edges of cutouts, and mortises.
 3. Stains and fillers may be omitted on bottom edges, edges of cutouts and mortises.
- B. Factory finish doors.
- C. Transparent Finish:

1. Grade: **Premium.**
2. Finish: AWI's "Architectural Woodwork Standards" System 5, conversion varnish or System 11, catalyzed polyurethane.
3. Staining: As selected by Architect and Owner from manufacturer's full range, to match existing.
4. Effect: Filled finish.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:

- 1. Mechanical door hardware for the following:
 - a. Swinging doors.

- B. Related Sections:

- 1. Section 081213 "Hollow Metal Frames" for door silencers provided as part of hollow-metal frames.

1.3 COORDINATION

- A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

- 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
- 2. Inspect and discuss preparatory work performed by other trades.
- 3. Review required testing, inspecting, and certifying procedures.

- B. Keying Conference: Conduct conference at Project site."

- 1. Conference participants shall also include Installer's Architectural Hardware Consultant.
- 2. Incorporate conference decisions into keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 - a. Flow of traffic and degree of security required.
 - b. Preliminary key system schematic diagram.

- c. Requirements for key control system.
- d. Requirements for access control.
- e. Address for delivery of keys.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples: For each exposed product in each finish specified, in manufacturer's standard size.
 - 1. Tag Samples with full product description to coordinate Samples with door hardware schedule.
- C. Door Hardware Schedule: Prepared by or under the supervision of Installer. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Shop Drawings, and Samples. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
 - 2. Format: Use same scheduling sequence and format and use same door numbers as in the door hardware schedule in the Contract Documents.
 - 3. Content: Include the following information:
 - a. Identification number, location, hand, size, and material of each door and frame.
 - b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - d. Fastenings and other pertinent information.
 - e. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
 - f. Mounting locations for door hardware.
 - g. List of related door devices specified in other Sections for each door and frame.
- D. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.

- C. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals.
- B. Schedules: Final door hardware and keying schedule.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
 - 1. Warehousing Facilities: In Project's vicinity.
 - 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to Owner by registered mail or overnight package service.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: Three (3) years from date of Substantial Completion, unless otherwise indicated.
 - a. Manual Closers: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of door hardware from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- B. Accessibility Requirements: For door hardware on doors in an accessible route, comply with ICC/ANSI A117.1.
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
 - 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
 - 3. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a point 3 inches (12 degrees) from the latch.

2.3 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled in Part 3 "Door Hardware Schedule" Article to comply with requirements in this Section.
 - 1. Door Hardware Sets: Provide quantity, item, size, finish, or color indicated, and products equivalent in function and comparable in quality to named products, where allowed.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Schedule" Article.

2.4 HINGES (BUTTS)

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal frames.
 - 1. Basis of Design:
 - a. Stanley Commercial Hardware, a division of Dormakaba; **CB179**
 - 2. 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. Hager Companies
 - b. McKinney Products Company; an ASSA ABLOY Group company
 - c. Substitutions: Under provisions of Section 012500 "Substitution Procedures".

2.5 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in Part 3 “Door Hardware Schedule”.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Mortise Locks: Minimum $\frac{3}{4}$ -inch latchbolt throw.
- C. Lock Backset: $2\frac{3}{4}$ inches, unless otherwise indicated.
- D. Lock Trim:
 - 1. Levers: Cast.
 - 2. Escutcheons (Roses): Wrought.
 - 3. Operating Device: Lever with escutcheons (roses).
- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
- F. Mortise Locks: BHMA A156.13; Security Grade 1; stamped steel case with steel or brass parts; Series 1000.
 - 1. Basis of Design:
 - a. Schlage Commercial Lock Division; an Allegion company; **L Series – 06, Vandlgard** functions
 - 2. 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. Dormakaba Group
 - b. SARGENT Manufacturing Company; an ASSA ABLOY Group company
 - c. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.6 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless-steel, or nickel silver.
 - 1. Manufacturer: Same manufacturer as for locking devices.
- B. Standard Lock Cylinders: BHMA A156.5; Grade 1; permanent cores that are removable; face finished to match lockset.
- C. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide ten (10) construction master keys.

2.7 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Incorporate decisions made in keying conference.
 - 1. Great-Grand Master Key System: Change keys, a master key, a grand master key, and a great-grand master key operate cylinders to match existing keying system.
- B. Keys: Brass.
 - 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: "DO NOT DUPLICATE."
 - 2. Quantity: In addition to one (1) extra key blank for each lock, provide the following:
 - a. Great-Grand Master Keys: Five (5).

2.8 OPERATING TRIM

- A. Operating Trim: BHMA A156.6; stainless-steel, unless otherwise indicated.
 - 1. Basis-of-Design Product:
 - a. Rockwood Manufacturing Company, an ASSA ABLOY Group company
 - 1) Pulls: **112-12**
 - 2) Push Plates: **RM1020 4x16**
 - 2. 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. Burns Manufacturing Incorporated
 - b. IVES Hardware; an Allegion company
 - c. Substitutions: Under provisions of Section 012500 "Substitution Procedures".

2.9 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
 - 1. Basis-of-Design Product:
 - a. LCN; an Allegion company; **4040XP Series**

2. 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. Dormakaba Group
 - b. SARGENT Manufacturing Company; an ASSA ABLOY Group company
 - c. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.
- B. Door closers to have delayed action cylinder, sized to the door leaf size.
- C. Door closers are to be mounted on the least conspicuous side of the door. The hardware supplier shall consult with the Architect to verify applications and note mounting locations on the hardware schedule.

2.10 MECHANICAL STOPS AND HOLDERS

- A. Wall- and Floor-Mounted Stops: BHMA A156.16; polished cast brass, bronze, or aluminum base metal.
 1. Basis-of-Design Product:
 - a. IVES Hardware; an Allegion company; **407 and 436 or 438**
 - 1) Provide wall bumpers wherever possible. Provide floor stops where the use of wall bumpers is not feasible, provided the location of the stop is not a stumbling hazard or would cause the door to rack at the hinges.
 2. 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. Door Controls International, Inc.
 - b. Rockwood Manufacturing Company, an ASSA ABLOY Group company
 - c. Substitutions: In accordance with Section 012500 “Substitution Procedures”.

2.11 OVERHEAD STOPS AND HOLDERS

- A. Overhead Stops and Holders: BHMA A156.8.
 1. Basis-of-Design Product:
 - a. Glynn-Johnson; an Allegion company; **90S**
 2. 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. Architectural Builders Hardware Mfg., Inc.
 - b. Rockwood Manufacturing Company, an ASSA ABLOY Group company
 - c. Substitutions: In accordance with Section 012500 “Substitution Procedures”.

2.12 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch-thick brass or bronze; with manufacturer's standard machine or self-tapping screw fasteners.
 - 1. Basis-of-Design Product:
 - a. Burns Manufacturing Incorporated
 - 2. 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. IVES Hardware, an Allegion company
 - b. Rockwood Manufacturing Company, an ASSA ABLOY Group company
 - c. Substitutions: In accordance with Section 012500 "Substitution Procedures".
- B. All plates are 2 inches less width of door on single doors, 1-inch less width of door on pairs.
 - 1. Kick Plates: 16 inches high.

2.13 AUXILIARY DOOR HARDWARE

- A. Auxiliary Hardware: BHMA A156.16.
 - 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. Hager Companies
 - b. Rockwood Manufacturing Company, an ASSA ABLOY Group company
 - c. Stanley Commercial Hardware, a division of Dormakaba
 - d. Substitutions: In accordance with Section 012500 "Substitution Procedures".

2.14 FABRICATION

- A. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
- B. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means

of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

2. Spacers or Sex Bolts:
 - a. All closers to be installed using through bolting.
3. Fasteners for Wood Doors: Comply with requirements in DHI's "Recommended Fasteners for Wood Doors."

2.15 FINISHES

- A. Provide finishes complying with BHMA A156.18. Unless otherwise specified in the hardware sets or specification, materials and finishes for the buildings shall be as follows:
 1. BHMA 626 or 630, but to match existing.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, wall and floor construction, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Frames: For surface-applied door hardware, drill and tap frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with door and hardware manufacturers' written instructions.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
 1. Standard Steel Frames: ANSI/SDI A250.8.
 2. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."

- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one (1) hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Replace construction cores with permanent cores as indicated in keying schedule.
- E. Stops: Provide wall or floor stops for doors unless other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

3.4 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

3.5 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.6 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, provide six (6) months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive

maintenance, repair, or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Provide parts and supplies that are the same as those used in the manufacture and installation of original products.

3.7 DOOR HARDWARE SCHEDULE

- A. Provide hardware as specified in the previous articles in sets according to the following schedule and as indicated in the Door Schedule on the Drawings.
- B. The hardware supplier shall meet with the Architect and/or Owner to determine lock functions and keying requirements.

HW-1

EACH TO HAVE:

BUTTS
1 PRIVACY LOCKSET
1 CLOSER
1 STOP
1 KICK PLATE
SILENCERS

DOOR: 156

HW-2

EACH TO HAVE:

BUTTS
1 PUSH/PULL OPERATING TRIM
1 CLOSER
1 STOP
1 KICK PLATE
SILENCERS

DOOR: 155, 157

HW-3

EACH TO HAVE:

BUTTS
1 PRIVACY LOCKSET
1 OH STOP
1 KICK PLATE
SILENCERS

DOORS: 14A, 15A

END OF SECTION 087100

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

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. Non-load-bearing steel framing for interior partitions.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653, G60, hot-dip galvanized unless otherwise indicated.
- B. Studs and Tracks: ASTM C 645.
 - 1. Steel Studs and Tracks:
 - a. Minimum Base-Metal Thickness: 20-gauge.
 - b. Depth: As indicated on Drawings.
- C. Slip-Type Head Joints: Where indicated, provide the following:
 - 1. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

- a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) ClarkDietrich; **MaxTrak Slotted Deflection Track**
 - 2) MarinoWare; **Slotted Track**
 - 3) MBA Building Supplies; **Slotted Deflecto Track**
 - 4) Substitutions: Under provisions of Section 012500 “Substitution Procedures”.
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 - 1. Minimum Base-Metal Thickness: 0.018-inch.
- E. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum ½-inch-wide flanges.
 - 1. Depth: 1½ inches.
 - 2. Clip Angle: Not less than 1½ by 1½ inches, 0.068-inch-thick, galvanized steel.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 - 1. Minimum Base-Metal Thickness: 0.018-inch.
 - 2. Depth: 7/8-inch.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Rigid Connections: Universal framing clip to attach and support rigid framing conditions including shear, tension, and two-axis loading.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dietrich Metal Framing; **Uni-Clip**
 - b. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.3 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames.
 - a. Install two (2) studs at each jamb unless otherwise indicated.
 - b. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
- E. Direct Furring:
 - 1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8-inch from the plane formed by faces of adjacent framing.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Interior gypsum board.

B. Related Requirements:

- 1. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.
- 2. Section 093000 "Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

B. Samples: For the following products:

- 1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

- C. Do not install panels that are wet, moisture damaged, and mold damaged.

- 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
- 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- 1. Georgia-Pacific Gypsum LLC
- 2. National Gypsum Company
- 3. USG Corporation
- 4. Substitutions: Under provisions of Section 012500 "Substitution Procedures".

- B. Mold (Moisture)-Resistant Gypsum Board: ASTM C 1396. With moisture- and mold-resistant core and paper surfaces.

- 1. Core: As indicated on Drawings.
- 2. Long Edges: Tapered.
- 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.

- 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
- 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475.

- B. Joint Tape:

- 1. Interior Gypsum Board: Paper.

- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
 - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033- to 0.112-inch-thick.
- C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
- D. Acoustical Joint Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pecora Corporation; **AC-20 FTR**
 - b. Specified Technologies, Inc.; **Smoke N Sound Acoustical Sealant**
 - c. USG Corporation; **SHEETROCK Acoustical Sealant**
 - d. Substitutions: Under provisions of Section 012500 "Substitution Procedures".
 - 2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one (1) framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16-inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow ¼- to 3/8-inch-wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide ¼- to ½-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board where indicated on Drawings.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels in most economical direction, with ends and edges occurring over firm bearing unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one (1) framing member in alternate courses of panels.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners, unless otherwise indicated.
 2. Bullnose Bead: Use at outside corners.
 3. LC-Bead: Use at exposed panel edges.
 4. L-Bead: Use where indicated.
 5. U-Bead: Use at exposed panel edges.

3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 1. Level 4: At panel surfaces that will be exposed to view, receiving wallcoverings and flat paints.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
 2. Level 5: At panel surfaces that will be exposed to view, receiving eggshell, semi-gloss, and gloss enamels.

- a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting" and 099600 "High-Performance Coatings".

3.6 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Ceramic mosaic tile.
2. Glazed wall tile.
3. Stone thresholds.
4. Tile backing panels.
5. Crack isolation membrane.

- B. Related Sections:

1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

- C. Samples:

1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
2. Full-size units of each type of trim and accessory for each color and finish required.
3. Stone thresholds in 6-inch lengths.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each tile-setting and -grouting product.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Tile and Trim Units: Furnish quantity of full-size units equal to three percent (3%) of amount installed for each type, composition, color, pattern, and size indicated.
 2. Grout: Furnish quantity of grout equal to three percent (3%) of amount installed for each type, composition, and color indicated.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications:
 1. Installer employs installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Build mockup of each type of floor tile installation.
 2. Build mockup of each type of wall tile installation.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
 - 1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
 - 2. Obtain crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
 - 1. Stone thresholds.
 - 2. Crack isolation membrane.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one (1) package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

2.3 TILE PRODUCTS

A. Basis-of-Design Product:

1. American Olean; Division of Dal-Tile International Inc.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Crossville, Inc.
2. Daltile; Division of Dal-Tile International Inc.
3. Substitutions: Under provisions of Section 012500 "Substitution Procedures".

C. Ceramic Tile Type (CFT-1): Factory-mounted unglazed ceramic mosaic tile.

1. Composition: Porcelain.
2. Module Size: 2 by 2 inches.
3. Thickness: ¼-inch.
4. Face: Plain with cushion edges.
5. Surface: Slip-resistant, with abrasive admixture.
 - a. Dynamic Coefficient of Friction (Wet): Not less than 0.42.
6. Tile and Pattern Color: Custom blend of the following:
 - a. **A62 Glacier**, twenty percent (20%)
 - b. **A04 Light Smoke Speckled**, forty percent (40%)
 - c. **A22 Storm Gray**, forty percent (40%)
7. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Internal Corners: Field-buttet square corners. For coved base, use angle pieces designed to fit with stretcher shapes.

D. Ceramic Tile Type: Glazed wall tile.

1. Face Size: 4 by 4 inches.
2. Thickness: 5/16-inch.
3. Face: Plain with cushion edges.
4. Tile Color, Glaze and Pattern Color:
 - a. **CWT-1: 0042 Gloss Light Smoke**
 - b. **CWT-2: 0081 Summer Rain**
 - c. **CWT-3: 0062 Glacier**
5. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base Cove: Cove, module size same as adjoining flat tile.

1) **CWB: 0042 Gloss Light Smoke**

- b. Wainscot Cap: Surface bullnose, module size same as adjoining flat tile.
- c. External Corners for Thin-Set Mortar Installations: Surface bullnose, same size as adjoining flat tile.
- d. Internal Corners: Field-buttet square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.

2.4 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 - 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16-inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to ½-inch or less above adjacent floor surface.
- B. Marble Thresholds: ASTM C 503, with a minimum abrasion resistance of 10 per ASTM C 1353 or ASTM C 241 and with honed finish.
 - 1. Description: Uniform, fine- to medium-grained stone in color as selected by Architect and Owner.

2.5 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, Type A, in maximum lengths available to minimize end-to-end butt joints.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Custom Building Products; **Wonderboard**
 - b. FinPan, Inc.; **Util-A-Crete Concrete Backer Board**
 - c. USG Corporation; **DUROCK Cement Board**
 - d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.
 - 2. Thickness: As indicated on Drawings.

2.6 CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Chlorinated Polyethylene Sheet: Non-plasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch nominal thickness.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Noble Company (The); **Nobleseal CIS**
 - b. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2.7 SETTING MATERIALS

- A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.
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. Bostik, Inc.
 - b. Custom Building Products
 - c. Laticrete International, Inc.
 - d. MAPEI Corporation
 - e. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.
 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 3. For wall applications, provide mortar that complies with requirements for non-sagging mortar in addition to the other requirements in ANSI A118.4.

2.8 GROUT MATERIALS

- A. Basis-of-Design Product:
1. Laticrete International, Inc.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Bostik, Inc.
 2. Custom Building Products
 3. MAPEI Corporation
 4. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.
- C. Water-Cleanable Epoxy Grout: ANSI A118.3.
1. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F (60 deg C) and 212 deg F (100 deg C), respectively, and certified by manufacturer for intended use.
 2. Colors:
 - a. Floors: **91 Slate Grey**
 - b. Walls: **89 Smoke Grey**

2.9 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, Portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

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- B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
 - C. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bostik, Inc.; **CeramaSeal Grout & Tile Sealer**
 - b. Custom Building Products; **Surfaceguard Sealer**
 - c. MAPEI Corporation; **KER003, Silicone Spray Sealer for Cementitious Tile Grout**
 - d. Substitutions: Under provisions of Section 012500 "Substitution Procedures".

2.10 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.

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4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer. Expect and include in the Base Bid the requirement to apply and machine level at least three (3) coats of leveler in all spaces.

B. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one (1) package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Ceramic Mosaic Tile: 1/16-inch.

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2. Glazed Wall Tile: 1/16-inch.
- G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
 - H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
 - I. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
 1. Do not extend crack isolation membrane under thresholds set in latex-Portland cement mortar. Fill joints between such thresholds and adjoining tile set on crack isolation membrane with elastomeric sealant.
 - J. Grout Sealer: Apply grout sealer to grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 TILE BACKING PANEL INSTALLATION

- A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-Portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.5 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.
- B. Allow crack isolation membrane to cure before installing tile or setting materials over it.

3.6 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 1. Remove grout residue from tile as soon as possible.
 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than ten (10) days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.7 PROTECTION

- A. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven (7) days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.8 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:
 - 1. Ceramic Tile Installation (**CFT**): TCNA F125A; thin-set mortar on crack isolation membrane.
 - a. Thin-Set Mortar: Latex-Portland cement mortar.
 - b. Grout: Water-cleanable epoxy grout.
- B. Interior Wall Installations, Masonry or Concrete:
 - 1. Ceramic Tile Installation (**CWT**): TCNA W202; thin-set mortar.
 - a. Thin-Set Mortar: Latex-Portland cement mortar.
 - b. Grout: Water-cleanable epoxy grout.
- C. Interior Wall Installations, Wood or Metal Studs or Furring:
 - 1. Ceramic Tile Installation (**CWT**): TCNA W244C or TCNA W244F; thin-set mortar on cementitious backer units or fiber-cement backer board.
 - a. Thin-Set Mortar: Latex-Portland cement mortar.
 - b. Grout: Water-cleanable epoxy grout.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

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 acoustical panels and exposed suspension systems for ceilings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.

1.4 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. Suspended ceiling components.
 - 2. Structural members to which suspension systems will be attached.
 - 3. Size and location of initial access modules for acoustical panels.
 - 4. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - 5. Perimeter moldings.
- B. Product Test Reports: For each acoustical panel ceiling, for tests performed by a qualified testing agency.
- C. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Full-size panels equal to two percent (2%) of each type of quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed component equal to two percent (2%) of quantity installed.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 - 1. Pressurized Plenums: Operate ventilation system for not less than forty-eight (48) hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
 - 2. Smoke-Developed Index: Fifty (50) or less.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Source Limitations:
 - 1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
 - 2. Suspension System: Obtain each type from single source from single manufacturer.

- B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15¾ inches away from test surface according to ASTM E 795.
- C. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
 - 1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 ACOUSTICAL PANEL MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Armstrong World Industries, Inc.
 - 2. CertainTeed Corp.
 - 3. USG Interiors, Inc.; Subsidiary of USG Corporation
 - 4. Substitutions: Under provisions of Section 012500 "Substitution Procedures".

2.4 ACOUSTICAL PANELS

- A. Basis-of-Design Product (ACT):
 - 1. Armstrong World Industries, Inc.; **Ultima Health Zone**
 - 2. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - a. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted; with vinyl overlay on face, back, and sealed edges.
 - a. Pattern: E (lightly textured).
 - 3. Color: White.
 - 4. LR: Not less than 0.86.
 - 5. NRC: Not less than 0.70.
 - 6. Edge/Joint Detail: Square Lay-In.
 - 7. Thickness: ¾-inch.
 - 8. Modular Size: 24 by 24 inches.
- B. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.5 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
 - 1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
- B. Attachment Devices: Size for five (5) times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641, Class 1 zinc coating, soft temper.
 - 2. Size: Select wire diameter so its stress at three (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 0.106-inch-diameter wire.
- D. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- E. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- F. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in place.

2.6 METAL SUSPENSION SYSTEM

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Armstrong World Industries, Inc.
 - 2. CertainTeed Corp.
 - 3. USG Interiors, Inc.; Subsidiary of USG Corporation
 - 4. Substitutions: Under provisions of Section 012500 "Substitution Procedures".
- B. Wide-Face, Double-Web, Hot-Dip Galvanized, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; hot-dip galvanized according to ASTM A 653; with prefinished, cold-rolled, 15/16-inch-wide flanges.
 - 1. Basis-of-Design Product:
 - a. Armstrong World Industries, Inc.; **Prelude XL 15/16 Inch Exposed Tee System**
 - 2. Structural Classification: Heavy-duty system.
 - 3. Face Design: Flat, flush.
 - 4. Finish: Painted white.

2.7 METAL EDGE MOLDINGS AND TRIM

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Armstrong World Industries, Inc.
 - 2. CertainTeed Corp.
 - 3. USG Interiors, Inc.; Subsidiary of USG Corporation
 - 4. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.
- B. Roll-Formed, Sheet-Metal Edge Moldings: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
 - 1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
 - 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.8 ACOUSTICAL SEALANT

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. Pecora Corporation; **AC-20 FTR Acoustical and Insulation Sealant**
 - b. USG Corporation; **SHEETROCK Acoustical Sealant**
 - c. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.
- B. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Exposed and Concealed Joints: Non-sag, paintable, non-staining latex sealant.
 - 2. Acoustical sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three (3) tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 6. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 7. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 - 8. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four (4) tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8-inch in 12 feet. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
 2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 3. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Resilient base.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.
- C. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.

- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

1.7 WARRANTY

- A. Provide manufacturer's written limited warranties against defects in materials and against premature wear prior to warranty expiration for the materials as follows:
 - 1. Resilient Base: Two (2) years.

PART 2 - PRODUCTS

2.1 REGULATORY REQUIREMENTS

- A. Conform to Class I rating with a flame spread of 0 to 25 in accordance with the requirements of Class A material in accordance with ASTM E 84. Rubber products shall be Class I, 0.45 watts/sq. cm in accordance with ASTM E 648 and NFPA 255.

2.2 THERMOPLASTIC-RUBBER BASE

- A. Basis of Design:
 - 1. Tarkett, USA; **Traditional Duracove**
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Burke Mercer Flooring Products, Division of Burke Industries Inc.
 - 2. Flexco, Corporation
 - 3. Mannington Mills, Inc.
 - 4. Roppe Corporation, USA
 - 5. Substitutions: Under provisions of Section 012500 "Substitution Procedures".
- C. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).
 - 1. Group: I (solid, homogeneous).
 - 2. Style: B, Cove.
- D. Thickness: 0.125-inch.
- E. Height: 6 inches minimum, but to match existing.
- F. Lengths: Coils in manufacturer's standard length.
- G. Outside and Inside Corners: Preformed.
- H. Colors: As selected by Architect and Owner from manufacturer's entire range, to match existing where required.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
 - 1. Adhesives shall have a VOC content of 50 g/L or less except that adhesive for rubber stair treads shall have a VOC content of 60 g/L or less.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Vinyl composition floor tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of floor tile.
 - 1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 2. Show details of special patterns.
- C. Samples: Full-size units of each color and pattern of floor tile required.
- D. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish one (1) box for every fifty (50) boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following time periods:
 1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 VINYL COMPOSITION FLOOR TILE (VCT)

- A. Basis of Design:
 1. Armstrong World Industries, Inc; **Standard EXCELON Imperial Texture**
- B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 1. Mannington Mills, Inc.
 2. Tarkett, Inc.
 3. Substitutions: Under provision of Section 012500 "Substitution Procedures".

- C. Tile Standard: ASTM F 1066, Class 1, solid-color tile.
- D. Wearing Surface: Smooth.
 - 1. Slip resistant with a Coefficient of Friction of 0.6 on level surface (dry).
- E. Thickness: 0.125-inch.
- F. Size: 12 by 12 inches.
- G. Colors and Patterns: As selected by Architect and Owner from manufacturer's full range, to match existing where required.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
- C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 7 or more than 10 pH.
4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb. of water/1000 sq. ft. in 24 hours.
 - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum seventy-five percent (75%) relative humidity level.
- 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. Expect and include in the Base Bid the requirement to apply and machine level at least three (3) coats of leveler in all spaces.
- D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 1. Lay tiles in pattern indicated.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 1. Lay tiles in pattern of colors and sizes indicated.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, adhesive, and blemishes from polyester resin composition floor tile surfaces before applying liquid floor polish.
 - 1. Apply number of coats recommended by the manufacturer.
- E. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete masonry units (CMU).
 - 2. Steel and iron.
 - 3. Galvanized metal.
 - 4. Gypsum board.
- B. Related Requirements:
 - 1. Section 099600 "High-Performance Coatings" for high-performance and special-use coatings.

1.3 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.
- B. Samples: For each type of paint system and in each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Apply coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.

- C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: Five percent (5%), but not less than 1 gal. of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints when relative humidity exceeds eighty-five percent (85%); at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Benjamin Moore & Co.
 - 2. ICI Paints
 - 3. Sherwin-Williams Company (The)
 - 4. Substitutions: Under provisions of Section 012500 "Substitution Procedures".

2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Non-Flat Paints and Coatings: 150 g/L.
 - 3. Primers, Sealers, and Undercoaters: 200 g/L.
 - 4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 - 5. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 - 6. Pretreatment Wash Primers: 420 g/L.
- D. Color and Sheen: As selected by Architect and Owner from manufacturer's entire range, to match existing where required.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two (2) paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Masonry (Clay and CMUs): Twelve percent (12%).
 - 2. Gypsum Board: Twelve percent (12%).
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.
- E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
 1. SSPC-SP 2, "Hand Tool Cleaning."
 2. SSPC-SP 3, "Power Tool Cleaning."
- F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 1. Use applicators and techniques suited for paint and substrate indicated.
 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 1. Paint the following work where exposed in equipment rooms, unless factory-finished:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Tanks that do not have factory-applied final finishes.
 - h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

 2. Paint the following work where exposed in occupied spaces, unless factory-finished:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - h. Other items as directed by Architect.

 3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 1. Contractor shall touch up and restore painted surfaces damaged by testing.

2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

- A. CMU Substrates:
 1. Latex System:
 - a. Block Filler: Block filler, latex, interior/exterior, **MPI #4**.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, eggshell, (Gloss Level 3), **MPI #52**.
- B. Steel Substrates:
 1. Quick-Dry Enamel System:
 - a. Prime Coat: Primer, alkyd, quick dry, for metal, **MPI #76**.
 - b. Topcoat: Alkyd, quick dry, semi-gloss (Gloss Level 5), **MPI #81**.
- C. Galvanized-Metal Substrates:
 1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Primer, galvanized, water based, **MPI #134**.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, eggshell (Gloss Level 3), **MPI #145**.
- D. Gypsum Board Substrates:
 1. Latex System:
 - a. Prime Coat: Primer sealer, latex, interior, **MPI #50**.
 - b. Intermediate Coat: Latex, interior, matching topcoat.

- c. Topcoat: Latex, interior, flat, (Gloss Level 1), **MPI #53**, at ceilings.
- d. Topcoat: Latex, interior, eggshell, (Gloss Level 3), **MPI #52**.

END OF SECTION 099123

SECTION 099600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes surface preparation and application of high-performance coating systems on the following substrates:
 - 1. Interior Substrates:
 - a. Concrete masonry units (CMUs).
 - b. Gypsum board.
- B. Related Requirements:
 - 1. Section 099123 "Interior Painting" for general field painting.

1.3 DEFINITIONS

- A. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.
- B. Samples: For each type of coating system and in each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Apply coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- C. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Coatings: Five percent (5%), but not less than 1 gal. of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply coatings when relative humidity exceeds eighty-five percent (85%); at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Benjamin Moore & Co.
 2. ICI Paints
 3. Sherwin-Williams Company (The)
 4. Substitutions: Under provisions of Section 012500 "Substitution Procedures".

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and are listed in "MPI Approved Products List."
- B. Material Compatibility:
 1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.
 3. Provide products of same manufacturer for each coat in a coating system.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base:
 1. Non-Flat Paints and Coatings: 150 g/L.
 2. Primers, Sealers, and Undercoaters: 200 g/L.

- D. Colors: As selected by Architect and Owner from manufacturer's entire range.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two (2) paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Masonry (Clay and CMUs): Twelve percent (12%).
 - 2. Gypsum Board: Twelve percent (12%).
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.
- D. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions.

3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 - 1. Use applicators and techniques suited for coating and substrate indicated.
 - 2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner will engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
 - 1. Contractor shall touch up and restore coated surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. CMU Substrates:

- 1. Epoxy System, **MPI INT 4.2G**:
 - a. Block Filler: Block filler, epoxy, **MPI #116**.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, gloss (Gloss Level 6), **MPI #77**.

B. Gypsum Board/Plaster Substrates:

- 1. Epoxy System, **MPI INT 9.2E**:
 - a. Prime Coat: Primer sealer, latex, interior, **MPI #50**.
 - b. Intermediate Coat: Epoxy, matching topcoat.
 - c. Topcoat: Epoxy, gloss (Gloss Level 6), **MPI #77**.

END OF SECTION 099600

SECTION 101400 - SIGNAGE

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. Panel signs.

- B. Related Sections include the following:

- 1. Section 015000 "Temporary Facilities and Controls" for temporary information and directional signs.
- 2. Section 220553 "Identification for Plumbing Piping and Equipment" for labels, tags, and nameplates for plumbing systems and equipment.
- 3. Section 230553 "Identification for HVAC Piping and Equipment" for labels, tags, and nameplates for HVAC systems and equipment.
- 4. Section 260553 "Identification for Electrical Systems" for labels, tags, and nameplates for electrical equipment.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: Show fabrication and installation details for signs.

- 1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
- 2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.

- C. Samples: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for the following:

- 1. Acrylic Sheet: Full-size Sample for each color required.

- D. Sign Schedule: Use same designations indicated on Drawings or as listed in special schedule.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

- B. Warranty: Special warranty specified in this Section.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Source Limitations for Signs: Obtain each sign type indicated from one (1) source from a single manufacturer.
- C. Regulatory Requirements: Comply with applicable provisions in 2010 ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of metal finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image colors and sign lamination.
 - 2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."
- B. Sign finish shall comply with the following performance requirements:
 - 1. Durability: Sign finish shall show no effect after repeated use of cleaners.

2.2 MATERIALS

- A. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).

2.3 PANEL SIGNS

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1. Best Sign Systems, Inc.

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2. Bayuk Graphic Systems, Inc.
 3. Intelligent Signage, Inc.
 4. Seton Identification Products
 5. Substitutions: Under provisions of Section 012500 "Substitution Procedures".
- B. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16-inch measured diagonally from corner to corner.
- C. Interior Signs: Provide matte finish plaques in sizes to accommodate the message indicated in the Signage Schedule on the Door Schedule and the Signage Details drawing in the Construction Documents. Fabricate of acrylic plastic conforming to ASTM D 709, Type NDP minimum 3/16-inch for non-slotted and 1/8-inch for slotted signs. Provide with square corners.
1. Graphics Application:
 - a. Raised Letters: Chemically weld 1/16-inch-thick acrylic message letters to front surface of plaque prior to application of background color to rear of sheet. These shall comply with Section 703.2.3 (not italic, oblique, script or decorative) and 703.2.4 (1-inch character height) of the ICC/ANSI A117.1 Code.
 - b. Pictogram: Each sign shall be provided with an international symbol of accessibility per Section 4.30.7 (Figure 43 a and b) of the Americans with Disabilities Act. The raised image pictogram shall be placed within the limits of the sign panel insert and to the right of the text.
 - c. Messages:
 - 1) Typeface: Helvetica Medium, with accompanying Grade 2 Braille message.
 - 2) Type Size: 1-inch large and small case, with width, height and stroke complying with the requirements of Section 703.2.5 (maximum stroke width fifteen percent (15%) of the height of each letter at the top surface of the character and thirty percent (30%) maximum of the height of each letter at the base; character spacing 1/8-inch minimum and four (4) times the tactile character stroke width maximum and spacing between lines shall be between one hundred thirty-five percent (135%) and one hundred seventy percent (170%) of the tactile character height) of the ICC/ANSI A117.1 Code.
 - 3) Background Color: In color selected by Architect and Owner from manufacturer's full range to match existing, except for accessibility pictogram background, which will be blue. Message Color: White.

2.4 FABRICATION

- A. General: Provide manufacturer's standard signs of configurations indicated.
1. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
 2. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.

2.5 FINISHES, GENERAL

- A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ACRYLIC SHEET FINISHES

- A. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for five (5) years for application intended.

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 work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
 - 1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.
- B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
 - 1. Silicone-Adhesive Mounting: Attach signs to irregular, porous, or vinyl-covered surfaces.

3.3 CLEANING AND PROTECTION

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.

- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101400

SECTION 102113.17 - PHENOLIC-CORE TOILET COMPARTMENTS

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. Phenolic-core toilet compartments configured as toilet enclosures and urinal screens.

B. Related Requirements:

- 1. Section 102800 "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories mounted on toilet compartments.

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 toilet compartments.

B. Shop Drawings: For toilet compartments.

- 1. Include plans, elevations, sections, details, and attachment details.
- 2. Show locations of cutouts for compartment-mounted toilet accessories.
- 3. Show locations of centerlines of toilet fixtures.
- 4. Show locations of floor drains.
- 5. Show overhead support or bracing locations.

C. Samples for Initial Selection: For each type of toilet compartment material indicated.

- 1. Include Samples of hardware and accessories involving material and color selection.

D. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of toilet compartment.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Door Hinges: One (1) hinge with associated fasteners.
 - 2. Latch and Keeper: One (1) latch and keeper with associated fasteners.
 - 3. Door Bumper: One (1) door bumper with associated fasteners.
 - 4. Door Pull: One (1) door pull with associated fasteners.
 - 5. Fasteners: Ten (10) fasteners of each size and type.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; 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.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

2.2 PHENOLIC-CORE TOILET COMPARTMENTS

- A. Basis of Design:
 - 1. Bobrick Washroom Equipment, Inc.; **1182 Duraline Series**
 - 2. No substitutions.
- B. Toilet-Enclosure Style: Overhead braced.
- C. Urinal-Screen Style: Floor anchored.
- D. Door, Panel, Screen, and Pilaster Construction: Solid phenolic-core panel material with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated), and with eased and polished edges. Provide minimum ¾-inch-thick doors and pilasters and minimum ½-inch-thick panels.
- E. Pilaster Shoes and Sleeves (Caps): Formed from stainless-steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.

- F. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters; with shoe and sleeve (cap) matching that on the pilaster.
- G. Brackets (Fittings):
 - 1. Stirrup Type: Ear or U-brackets; stainless-steel.
 - a. Same wall brackets are to be used for both panels and screens.
- H. Phenolic-Panel Finish:
 - 1. Facing Sheet Finish: One (1) color and pattern in each room.
 - 2. Color and Pattern: **Arborite S-513 CA Denim Blue**
 - 3. Edge Color: Manufacturer's standard.

2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard operating hardware and accessories.
 - 1. Material: Stainless-steel.
 - 2. Hinges: Manufacturer's standard paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees, allowing emergency access by lifting door.
 - 3. Latch and Keeper: Manufacturer's standard surface-mounted self-latching unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
 - 4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
 - 5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
 - 6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with anti-grip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless-steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 MATERIALS

- A. Aluminum Castings: ASTM B 26.
- B. Aluminum Extrusions: ASTM B 221.
- C. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- D. Stainless-Steel Castings: ASTM A 743.

2.5 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at bottoms of posts. Provide shoes and sleeves (caps) at posts to conceal anchorage.
- D. Door Size and Swings: Unless otherwise indicated, provide 24-inch-wide in-swinging doors for standard toilet compartments and 36-inch-wide out-swinging doors with a minimum 32-inch-wide clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: ½-inch.
 - b. Panels and Walls: 1-inch.
 - 2. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three (3) brackets attached at midpoint and near top and bottom of panel.
 - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1¾ inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer

than two (2) fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

- C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched, unless the compartment is designated as accessible, where the doors are to return to fully closed position. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113.17

SECTION 102600 - WALL AND DOOR PROTECTION

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. Corner guards.

B. Related Requirements:

- 1. Section 087100 "Door Hardware" for metal armor, kick, mop, and push plates.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

- 1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For each type of wall and door protection showing locations and extent.

- 1. Include plans, elevations, sections, and attachment details.

C. Samples: For each type of exposed finish on the following products, prepared on Samples of size indicated below.

- 1. Corner Guards: 12 inches long. Include examples of joinery, corners, and field splices.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Corner-Guards: Full-size of maximum length equal to two percent (2%) of each type, color, and texture of units installed, but no fewer than two (2), 4-foot-long units.
2. Mounting and Accessory Components: Amounts proportional to the quantities of extra materials. Package mounting and accessory components with each extra material.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Altro USA
 2. Commercial Corner Guards
 3. Construction Specialties, Inc.
 4. IPC Door and Wall Protection Systems; Division of InPro Corporation
 5. Korogard Wall Protection Systems; a division of RJF International Corporation
 6. Level Digital Wallcoverngs
 7. Marlite, Inc., a division of Nudo Products, Inc.
 8. Pawling Corporation
 9. Substitutions: Under provisions of Section 012500 "Substitution Procedures".
- B. Source Limitations: Obtain wall and door protection products of each type from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Comply with ASTM E 84 or UL 723; 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.

2.3 CORNER GUARDS

- A. Surface-Mounted, Metal Corner Guards: Fabricated as one-piece from formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.
 1. Material: Stainless-steel sheet, Type 304.
 - a. Thickness: Minimum 16-gage.
 - b. Finish: Directional satin, No. 4.
 2. Wing Size: Nominal 1½ by 1½ by 96 inches.
 3. Mounting: Flat-head, countersunk screws through factory-drilled mounting holes.

2.4 MATERIALS

- A. Stainless-Steel Sheet: ASTM A 240.
- B. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Remove tool and die marks and stretch lines, or blend into finish.
 - 2. Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 3. Run grain of directional finishes with long dimension of each piece.
 - 4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- B. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing wall and door protection.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

- B. Mounting Heights: Install wall and door protection in locations and at mounting heights indicated on Drawings.
- C. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.
- D. Corner Guards: Install at all gypsum board wall outside corners, bottom edge mounted at top edge of wall base.

3.4 CLEANING

- A. Immediately after completion of installation, clean in accordance with manufacturer's instructions.

END OF SECTION 102600

SECTION 102800 - TOILET, BATH, AND LAUNDRY 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. Public-use washroom accessories.
- 2. Private-use bathroom accessories.
- 3. Hand dryers.

B. Related Sections:

- 1. Section 061000 "Rough Carpentry" for blocking coordination.

1.3 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

- 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
- 3. Include electrical characteristics.

B. Samples: Full size, for each exposed product and for each finish specified.

- 1. Approved full-size Samples will be returned and may be used in the Work.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

- 1. Identify locations using room designations indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer’s special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

1.7 WARRANTY

- A. Manufacturer’s Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, visible silver spoilage defects.
 - 2. Warranty Period: Fifteen (15) years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Hand Dryers: Manufacturer agrees to repair or replace hand dryers that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Seven (7) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED MATERIALS

- A. Owner-Furnished Materials:
 - 1. Toilet tissue (roll) dispenser, where indicated on Drawings.
 - 2. Liquid-Soap dispenser.
- B. Materials are to be provided by Owner but installed by Contractor.

2.2 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.

2.3 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. A & J Washroom Accessories, Inc.
 - 2. American Specialties, Inc.
 - 3. Bobrick Washroom Equipment, Inc.
 - 4. Bradley Corporation
 - 5. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.
- B. Source Limitations: Obtain accessories from single source from single manufacturer, unless otherwise indicated.

2.4 PUBLIC-USE WASHROOM ACCESSORIES

A. Toilet Tissue (Roll) Dispenser:

1. Basis-of-Design Product: **Bobrick #B-4288**
2. Description: Double roll dispenser.
3. Mounting: Surface mounted.
4. Operation: Non-control delivery with theft-resistant spindle.
5. Capacity: Designed for 5¼-inch-diameter tissue rolls.
6. Material and Finish: Stainless-steel, No. 4 finish (satin) with plastic spindle.
7. Lockset: Tumbler type.

B. Grab Bar:

1. Basis-of-Design Product: **Bobrick #B-6806.99x18, x36 and x42**
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless-steel, 0.05-inch-thick.
 - a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
4. Outside Diameter: 1½ inches.
5. Configuration and Length: As indicated in the Drawings.

C. Sanitary-Napkin Disposal Unit:

1. Basis-of-Design Product: **Bobrick #B-270**
2. Mounting: Surface mounted.
3. Door or Cover: Self-closing, disposal-opening cover.
4. Receptacle: Removable.
5. Material and Finish: Stainless steel, No. 4 finish (satin).
6. Locations: Female gang restrooms only.

D. Mirror Unit:

1. Basis-of-Design Product: **Bobrick #B-290-2436**
2. Frame: Stainless-steel angle, 0.05-inch-thick.
 - a. Corners: Manufacturer's standard.
3. Hangers: Produce rigid, tamper- and theft-resistant installation, using one (1) of the methods indicated below.
 - a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
 - b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
4. Size: 24x36.

2.5 PRIVATE-USE BATHROOM ACCESSORIES

A. Robe Hook:

1. Basis-of-Design Product: **Bobrick #B-6827**
2. Description: Single-prong unit.
3. Material and Finish: Stainless steel, No. 4 finish (satin).
4. Location: On back of single use restroom doors.

2.6 HAND DRYERS

A. Warm-Air Dryer:

1. Basis-of-Design Product: **Xlerator XL-SB-H**
 - a. No substitutions.
2. Description: Standard-speed, warm-air hand dryer with HEPA filtration system.
3. Mounting: Surface mounted.
4. Operation: Infrared-sensor activated with timed power cut-off switch.
 - a. Operation Time: Maximum 35 seconds.
5. Cover Material and Finish: Stainless-steel, ASTM A 480 No. 4 finish (satin).
6. Electrical Requirements: 110-120 V, 11-13 A, 1240-1450 W, 50/60 Hz.

2.7 MATERIALS

- A. Stainless-Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Galvanized-Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.
- C. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- D. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal ¼-inch-thick.
- E. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.8 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six (6) keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

SECTION 210100 - GENERAL CONDITIONS FOR FIRE PROTECTION TRADE

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. General Conditions, Supplementary Conditions and Division 01 paragraphs may be repeated in this Division for emphasis or for inclusion of more stringent/additional related requirements. Such repetition shall not be construed to reduce the requirements of those Divisions nor to eliminate other requirements under those Divisions.

1.2 DESCRIPTION

- A. The General Conditions are a part of this Division and are to be considered a part of this Contract.
- B. Where items of the General Conditions are repeated in other Sections of the Specifications, it is merely intended to qualify or to call particular attention to them. It is not intended that any other parts of the General Conditions shall be assumed to be omitted if not repeated therein.
- C. This Section applies equally and specifically to all Contractors supplying labor and/or equipment and/or materials as required under each Section of Division 21.
- D. The following information contains specifications of Work in connection with, and in addition to, this Division:
 - 1. All drawings associated with the project.
 - 2. All specifications associated with the project.
- E. Divisions of work responsibilities shall be defined and directed by the General Contractor or Construction Manager.

1.3 INTENT

- A. It is the intent of the Specifications and Drawings to call for finished work, tested and ready for operation.
- B. Furnish, deliver, and install any apparatus, appliance, material, or work not shown on Drawings but mentioned in the Specifications, or vice versa, or any incidental accessories necessary to make the Work complete and perfect in all respects and ready for operation, even if not particularly specified, under their respective Section without additional expense to the Owner.
- C. Include in the work minor details not usually shown or specified but necessary for proper installation and operation, as though they were hereinafter shown or specified.
- D. Provide Engineer written notice of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules, or regulations of authorities having jurisdiction; and any

GENERAL CONDITIONS FOR FIRE PROTECTION TRADE

necessary items of Work omitted. In the absence of such written notice, it is mutually agreed that Work under each Section has included the cost of all required items for the accepted, satisfactory functioning of the entire system without extra compensation.

- E. The Work indicated is diagrammatic. The Architect and/or Engineer may require as part of this Contract, the relocation of devices to reasonable distances from the general locations shown.
- F. Verbal clarifications of the Drawings or Specifications during the bid period are not to be relied upon.

1.4 DRAWINGS

- A. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. (Do not scale the Drawings.) Consult the Architectural Drawings and Details for exact location of fixtures and equipment; where same are not definitely located, obtain this information from the Architect.
- B. Closely follow Drawings in layout of Work; check Drawings of other Divisions to verify spaces in which work will be installed. Maintain maximum headroom. Where space conditions appear inadequate, Engineer shall be notified before proceeding with installations.
- C. Engineer may, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades and/or for proper execution of the work.
- D. Where variances occur between the Drawings and Specifications or within either of the Documents, include the item or arrangement of better quality, greater quantity, or higher cost in the Contract price. The Engineer shall decide on the item and the manner in which the work shall be installed.

1.5 SURVEYS AND MEASUREMENTS

- A. Before submitting a Bid, the Contractor shall visit the site and shall become thoroughly familiar with all conditions under which the work will be installed. Contractor will be held responsible for any assumptions, omissions, or errors made as a result of failure to become familiar with the site and the Contract Documents.
- B. Base all measurements, both horizontal and vertical, from established benchmarks. All Work shall agree with these established lines and levels. Verify all measurements at the site and check the correctness of same as related to the Work.
- C. Should the Contractor discover any discrepancies between actual measurements and those indicated which prevent following good practice or the intent of the Drawings and Specifications, notify the Engineer to not proceed with that Work until instructions have been received from the Engineer.

1.6 CODES AND STANDARDS

- A. The Codes and Standards listed below apply to all Work. Where Codes or Standards are mentioned in these Specifications, follow the latest edition or revision.
- B. The current adopted editions of the following State or local Codes apply:

2018 Connecticut State Building Code (CSBC) including portions of the 2015 International Building Code
2018 Connecticut State Fire Code
2018 Connecticut State Fire Safety Code including portions of the 2015 International Fire Code (CSFSC)
2015 NFPA 101 Life Safety Code (NFPA101)
2015 Connecticut Fire Prevention Code (CFPC)
2015 NFPA 1 Fire Code (NFPA101)
NFPA 13/2013, Standard for the Installation of Sprinkler Systems
NFPA 54/2015, National Fuel Gas Code
NFPA 70/2017, National Electrical Code
NFPA 72/2013, National Fire Alarm Code
AWWA Standards
Factory Mutual Approval Guide: latest edition
Pipe Hangers and Supports: MSS SP-58
UL Compliance
The American National Standards Institute (ANSI) A117.1/2009
Local Building Code

C. The following Standards shall be used where referenced by the following abbreviations:

AABC Associated Air Balance Council
ACGIH American Conference of Governmental Industrial Hygienists
ADC Air Diffusion Council
AGA American Gas Association
AIA American Institute of Architects
AMCA Air Moving and Conditioning Association
ANSI American National Standards Institute
API American Petroleum Institute
ARI Air Conditioning and Refrigeration Institute
ASE Association of Safety Engineers
ASHRAE American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME American Society of Mechanical Engineers
ASPE American Society of Plumbing Engineers
ASTM American Society of Testing and Materials
AWS American Welding Society
AWWA American Water Works Association
CGA Compressed Gas Association
CSA Canadian Standards Association
CISPI Cast Iron Soil Pipe Institute
EJMA Expansion Joint Manufacturing Association
EPA Environmental Protection Agency
FM Factory Mutual Insurance Association
FSSC Federal Specification
HIS Hydraulic Institute Standards
IBR Institute of Boiler and Radiator Manufacturers
IEEE Institute of Electrical and Electronics Engineers
IRI Industrial Risk Insurers
ISO Insurance Services Office
MCAA Mechanical Contractors Association of America
MSS Manufacturers Standardization Society

NBS National Bureau of Standards
NEBB National Environmental Balancing Bureau
NEMA National Electrical Manufacturers Association
NFPA National Fire Protection Association
NOFI National Oil Fuel Institute
NRC National Research Council
NSC National Safety Council
NSF National Sanitation Foundation
OSHA Occupational Safety and Health Administration
PDI Plumbing and Drainage Institute
SAMA Scientific Apparatus Manufacturers Association
SBI Steel Boiler Industry (Division of Hydronics Institute)
SMACNA Sheet Metal and Air Conditioning Contractors National Association
STI Steel Tank Institute
UL Underwriters' Laboratories

- D. All materials furnished and all work installed shall comply with the rules and recommendations of the NFPA, the requirements of the local utility companies, the recommendations of the fire insurance rating organization having jurisdiction, and the requirements of all Governmental departments having jurisdiction.
- E. Include in the Work, without extra cost to the Owner, any labor, materials, services, apparatus, and Drawings in order to comply with all applicable laws, ordinances, rules, and regulations, whether or not shown on Drawings and/or specified.

1.7 PERMITS AND FEES

- A. Give all necessary notices, obtain all permits; pay all Government and State sales taxes and fees where applicable, and other costs, including utility connections or extensions in connection with the Work. File all necessary Drawings, prepare all Documents and obtain all necessary approvals of all Governmental and State departments having jurisdiction, obtain all required certificates of inspections for Work and deliver a copy to the Engineer before request for acceptance and final payment for the Work.

1.8 SEISMIC RESTRAINT

- A. General: This project is in a seismic zone per State and/or Local Codes and Ordinances and all materials and equipment shall be installed, supported, and seismically restrained accordingly. Verify current seismic requirements based on project location and with Code requirements.
- B. 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 vibration isolation bases and seismic restraints that are similar to those required for this Project in material, design, and extent.
- C. Shop Drawings: Show designs and calculations, certified by a professional engineer, for the following:

1. Design Calculations: Calculations for selection of vibration isolators, design of vibration isolation bases, design of seismic supports, and selection of seismic restraints for all equipment and materials.
 2. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to the structure and to the supported equipment. Include auxiliary motor slides and rails, and base weights.
 3. Seismic Restraint Details: Detail fabrication and attachment of restraints, supports, and snubbers.
- D. Installation: Installation shall be carried out in strict accordance with the Seismic Engineer's submittal, current Code, accepted standards, and the equipment and material manufacturers' recommendations.

1.9 COORDINATION

- A. Carry out all work in conjunction with other trades and give full cooperation in order that all Work may proceed with a minimum of delay and interference. Particular emphasis is placed on timely installation of major apparatus and furnishing other Contractors, especially the General Contractor or Construction Manager, with information as to openings, chases, sleeves, bases, inserts, equipment locations, panels, access doors, etc. required by other trades.
- B. Contractors are required to examine all the Project Drawings and mutually arrange Work so as to avoid interference. In general, ductwork, heating piping, sprinkler piping, and drainage lines take precedence over water, gas, and electrical conduits. The Engineer regarding the arrangement of Work, which cannot be agreed upon by the Contractors, will make final decisions.
- C. Where the Work of the Contractor will be installed in close proximity to or will interfere with Work of other trades, assist in working out space conditions to make a satisfactory adjustment.
- D. If Work is installed before coordinating with other Divisions or so as to cause interference with Work of other Sections, the Contractor causing the interference will make necessary changes to correct the condition without extra charge to the Owner.
- E. Initial contact and coordination have been conducted with utility entities for the purpose of the preparation of Bid Documents. The Contractor shall coordinate all final specific utility requirements.

1.10 ACCEPTANCES

- A. The equipment, materials, Workmanship, design, and arrangement of all Work installed are subject to the review of the Engineer.
- B. Within thirty (30) days after the awarding of a Contract, submit to the Engineer for review a list of manufacturers of equipment proposed for the Work. The intent to use the exact makes specified does not relieve the Contractor of the responsibility of submitting such a list.
 1. If extensive or unacceptable delivery time is expected on a particular item of equipment specified, notify the Engineer, in writing, within thirty (30) days of the awarding of the Contract. In such instances, deviations may be made pending acceptance by the Engineer or the Owner's representative.

- C. Where any specific material, process, or method of construction or manufactured article is specified by reference to the catalog or model number of a manufacturer, the Specifications are to be used as a guide and are not intended to take precedence over the basic duty and performance specified or noted on the Drawings. In all cases, verify the duty specified with the specific characteristics of the equipment offered for review. Equipment characteristics are to be used as mandatory requirements where the Contractor proposes to use an acceptable equivalent.
- D. If material or equipment is installed before shop drawing review, liability for its removal and replacement is assumed by the Contractor, at no extra charge to the Owner, if, in the opinion of the Engineer, the material or equipment does not meet the intent of the Drawings and Specifications.
- E. Failure on the part of the Engineer to reject shop drawings or to reject Work in progress shall not be interpreted as acceptance of Work not in conformance with the Drawings and/or Specifications. Correct Work not in conformance with the Drawings and/or Specifications whenever non-conformance is discovered.

1.11 EQUIPMENT DEVIATIONS

- A. Refer to Section 016000 "Product Requirements". Where the Contractor proposes to deviate (substitute or provide an equivalent) from the equipment or materials as hereinafter specified, he shall do so by making a request in writing. The Contractor shall state in his request whether it is a substitution or an equivalent to that specified, and the amount of credit or extra cost involved. A copy of said request shall be included in the Base Bid with manufacturer's equipment cuts. The Base Bid shall be based on using the materials and equipment as specified and scheduled with no exceptions. Equipment manufacturers scheduled on Drawings are considered Base Bid and any other acceptable manufacturers listed in the specifications is considered a substitution and equipment deviation and subject to the requirements for equipment substitution and deviation. When any alternate manufacturer does not qualify acceptable, as determined by the Engineer, provide the Base Bid manufacturer at no additional cost to Owner.
- B. In these Specifications and on the accompanying Drawings, one (1) or more makes of materials, apparatus, or appliances may have been specified for use in this installation. This has been done for convenience in fixing the standard of workmanship, finish, and design required for installation. In the event that only one (1) manufacturer of a product is specified, and it is found that the manufacturer has discontinued the product, the Contractor shall use an acceptable equivalent product that meets the requirements of an equivalent product, as noted below, and has all the features of the originally specified product. The details of workmanship, finish, and design, and the guaranteed performance of any material, apparatus, or appliance which the Contractor desires to deviate for those mentioned herein shall also conform to these standards.
- C. Where no specific make of material, apparatus, or appliance is mentioned, any first-class product made by a reputable manufacturer may be submitted for the Engineer's review.
- D. Where two (2) or more names are given as equivalents, the Contractor must use the specified item or one (1) of the named equivalents. Where one (1) name only is used and is followed by the words "or acceptable equivalent", the Contractor must use the item named or he may apply for an equipment deviation through the prescribed manner in accordance with this Specification.
- E. Equipment, material, or devices submitted for review as an "accepted equivalent" shall meet the following requirements:

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1. The equivalent shall have the same construction features such as, but not limited to:
 - a. Material thickness, gauge, weight, density, etc.
 - b. Welded, riveted, bolted, etc., construction.
 - c. Finish, undercoatings, corrosion protection.
 2. The equivalent shall perform with the same or better operating efficiency.
 3. The equivalent shall have equal or greater reserve capacity.
 4. The equivalent shall be locally represented by the manufacturer for service, parts, and technical information.
 5. The equivalent shall bear the same labels of performance certification as is applicable to the specified item, such as AMCA or ARI labels.
- F. Where the Contractor proposes to use an item of equipment other than specified or detailed on the Drawings which requires any redesign of the structure, partitions, foundations, piping, wiring, or any other part of the mechanical, electrical, or architectural layout, all such redesign and all new drawings and detailing required therefore shall be prepared by the Designers of Record at the expense of the Contractor and at no additional cost to the Owner.
- G. Where such accepted deviation or substitution requires a different quantity and arrangement of piping, ductwork, valves, pumps, insulation, wiring, conduit, and equipment from that specified or indicated on the Drawings, the Contractor shall, with the acceptance by the Engineer, furnish and install any such additional equipment required by the system at no additional cost to the Owner, including any costs added to other trades due to the substitution.
- H. The Engineer shall determine if an "accepted equivalent" to a manufacturer listed in the Specifications is considered acceptable.
- 1.12 SHOP DRAWINGS
- A. Refer to Section 013300 "Submittals" as well as individual specification sections for additional submittal information.
- B. Submitted shop drawings of fire sprinkler system(s) and/or fire standpipe system(s) shall be sealed and signed by an Engineer registered to practice engineering in the State of Connecticut or licensed Layout Technician registered in the State of Connecticut.
- C. All fire protection submittals shall be submitted in a single package. "Piece-Meal" or "Partial" submittals will not be accepted, and will be rejected and returned without review, unless prior approval from the Engineer has been obtained. NO EXCEPTIONS.
1. Submittals shall be provided in an expandable, 3-ring, hard cover binder, labeled with the Project information. The submittals for the entire Fire Protection Division 21 sections shall be submitted at the same time, not "section-by-section."
 2. Each section within the binder shall be tabbed, by fire protection specification section, and include all materials specified in that section.
 3. Two (2) full and complete copies of the binders shall be provided for preliminary review. Upon review, the Engineer will retain one (1) copy and the other copy will be returned to the Contractors, for distribution to the subcontractors. The second review shall include the total number of copies of the binders as required by Division 01.

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4. The two (2) copies for preliminary review shall be submitted within ninety (90) days of execution of the Contract.
5. An index shall be provided indicating:
 - a. A complete shop drawing log depicting ALL submittals to be provided for the Division, whether included in the full package or not. Log shall be updated to reflect the submittals provided.
 - b. Specification section.
 - c. Product.
 - d. Plan code.
 - e. Supplier, Manufacturer, Model Number, Contact List, etc.
- D. Fire protection long lead items are excluded from requirement but must be submitted complete in their entirety by specification section, when provided.
- E. The Contractor shall submit for review detailed shop drawings of all equipment and material specified in each section and coordinated ductwork layouts. No material or equipment may be delivered to the job site or installed until the Contractor has received shop drawings for the particular material or equipment which have been properly reviewed.
- F. Provide shop drawings for all devices specified under equipment specifications for all systems, materials, equipment, and/or devices. Shop drawings shall include manufacturers' names, catalog numbers, cuts, diagrams, and other such descriptive data as may be required to identify and accept the equipment. A complete list in each category (example: all fixtures) of all shop drawings, catalog cuts, material lists, etc., shall be submitted to the Engineer at one time. No consideration will be given to a partial shop drawing submittal.
 1. Equipment shop drawings shall contain full range performance curves, graphs, tables, or other pertinent data which clearly indicates operational range of a given unit size. Computer generated/plotted curves, based solely on design performance, will not be accepted.
 2. All specific options and/or alternatives shall be clearly indicated. Failure to do so shall be grounds for rejection.
- G. Submittals shall be marked with the trade involved, i.e., HVAC, plumbing, fire protection, etc. and the specific associated specification section.
- H. Where multiple quantities or types of equipment are being submitted, provide a cover sheet (with a list of contents) on the submittal identifying the equipment or material being submitted.
- I. Failure to submit shop drawings in ample time for review shall not entitle the Contractor to an extension of Contract time. No claim for extension by reason of such default will be allowed, nor shall the Contractor be entitled to purchase, furnish and/or install equipment which has not been reviewed by the Engineer. The Contractor shall incur all costs associated with delay of construction due to equipment and/or materials arriving late due to late or improper shop drawing submittal.
- J. The Contractor shall furnish all necessary templates, patterns, etc., for installation work and for the purpose of making adjoining work conform; furnish setting plans and shop details to other trades as required.

- K. Acceptance rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are reviewed, review does not indicate that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the Contract Drawings and Specifications. Verify available space prior to submitting shop drawings.
- L. Acceptance of shop drawings shall not apply to quantity nor relieve Contractor of his responsibility to comply with intent of Drawings and Specifications.
- M. Acceptance of shop drawings is final and no further changes will be allowed without the written consent of the Engineer.
- N. Shop drawing submittal sheets which may show items that are not being furnished shall have those items crossed off to clearly indicate which items will be furnished.
- O. Contractor shall make any corrections required by Engineer and shall resubmit required number of corrected copies of shop drawings or new samples until accepted. Contractor shall direct specific attention in writing or on resubmitted shop drawings to revisions other than corrections requested by Engineer on previous submissions. Engineer shall review no more than one (1) resubmittal of any shop drawing or sample at Owner's expense. The fees for review of additional resubmittals shall be paid by the Contractor at the Engineer's standard rates.
- P. Conform the fire protection work to the requirements herein. Provide offsets, fittings, drains, and accessories which may be required to accommodate structural, HVAC, plumbing, existing conditions, etc. Investigate the structural and finish conditions affecting the work and arrange the work accordingly. Provide such piping, fittings, valves, and accessories as may be required to meet such conditions.

1.13 CHANGES IN WORK

- A. Change Order is a written order to the Contractor signed by the Owner and the Architect, issued after Contracts have been awarded, authorizing a change in the work or an adjustment in the Contract sum or the Contract time. A Change Order signed by the Contractor indicates his agreement therewith, including the adjustment in the Contract sum or the Contract time.
- B. All changes in the work shall follow the recommendations of the AIA "General Conditions of the Contract for Construction", Article 7.

1.14 MANUFACTURER'S IDENTIFICATION

- A. All component parts of each item of equipment or device shall bear the manufacturer's nameplate giving name of manufacturer, description, size, type, serial and model number, electrical characteristics, etc., in order to facilitate maintenance or replacement. The nameplate of a Contractor or distributor will not be acceptable.
- B. All material and equipment for the electrical portion of the mechanical systems shall bear the label of or be listed by UL, or other accredited authoritative agencies or testing organizations approved by the authority having jurisdiction.

1.15 RECORD DRAWINGS

- A. Refer to Section 017700 “Project Record Documents”.
- B. Maintain at the job site a record set of Mechanical Drawings on which any changes in location or routing of all equipment, materials, and access panels shall be recorded.
- C. At the end of construction, the Contractor shall provide the Owner with a complete set of As-Built Drawings, including all updated coordination drawings, ductwork, and piping plans. Prepare As-Built documentation utilizing the most recent version of AutoCAD.
- D. If electronic copies of the contract documents are made available to the Contractor for use in production of As-Built documentation, the Contractor assumes responsibility for completeness and accuracy of the As-Built documents. Translation or manipulation of electronic documents provided to the Contractor is the responsibility of the Contractor.

1.16 MATERIALS AND WORKMANSHIP

- A. All materials and apparatus required for the work, except as otherwise specifically indicated, shall be new, of first-class quality, and shall be furnished, delivered, erected, connected, and finished in every detail and be so selected and arranged as to fit properly into the building spaces. Where no specific type or quality of material is given, a first-class standard article as accepted by industry standards shall be furnished.
- B. The Contractor shall furnish the services of an experienced superintendent who shall be constantly in charge of the installation of the work together with all skilled workmen, fitters, metal workers, welders, helpers, and laborers required to unload, transfer, erect, connect, adjust, start, operate, and test each system.
- C. Unless otherwise specifically indicated on the Drawings or Specifications, all equipment and materials shall be installed with the acceptance of the Engineer and in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.
- D. All labor for installation of mechanical systems shall be performed by experienced, skilled tradesmen under the supervision of a licensed journeyman foreman. All work shall be of a quality consistent with good trade practice and shall be installed in a neat, workmanlike manner. The Engineer reserves the right to reject any work which, in his opinion, has been installed in a substandard, dangerous, or unserviceable manner. The Contractor shall replace said work in a satisfactory manner at no extra cost to the Owner.

1.17 PROTECTION OF MATERIALS AND EQUIPMENT

- A. Work under each Section shall include protecting the work and material of all other Sections from damage by work or workmen and shall include making good all damage thus caused.
- B. The Contractor shall be responsible for work and equipment until the facility has been accepted by the Owner. Protect work against theft, injury, or damage and carefully store material and equipment received on site which is not immediately installed. Close open ends of work with temporary covers or plugs during construction to prevent entry of foreign material.

- C. Work under each Section includes receiving, unloading, uncrating, storing, protecting, setting in place, and completely connecting equipment supplied under each Section. Work under each Section shall also include exercising special care in handling and protecting equipment and fixtures and shall include the cost of replacing any of the equipment and fixtures which are missing or damaged.
- D. Equipment and material stored on the job site shall be protected from the weather, vehicles, dirt and/or damage by workmen or machinery. Ensure that all electrical or absorbent equipment or material is protected from moisture during storage.

1.18 BASES AND SUPPORTS

- A. Unless otherwise specifically noted, the Contractor shall furnish all necessary supports, rails, framing, bases, and piers required for all equipment furnished under this Division.
- B. Unless otherwise indicated in individual trade Sections, pumps, fans, air handlers, boilers, chillers, tanks, compressors, and other rotating machinery shall be mounted on a minimum of 4-inch-high concrete pads which shall be furnished and installed per Division 03. All pads shall be extended not less than 4 inches beyond machine base in all directions and sufficient for seismic anchoring with top edge chamfered. Shop drawings of all foundations and pads shall be submitted to the Engineer for review before they are constructed. The Mechanical Contractor shall field coordinate all required dimensional and necessary loading information.
- C. Construction of foundations, supports, pads, bases, and piers where mounted on the floor shall be of the same finish quality as the adjacent and surrounding flooring material.
- D. Unless otherwise shown, all equipment shall be securely attached to the building structure in an acceptable manner. Attachments shall be of a strong and durable nature; any attachments that are insufficient, in the opinion of the Engineer, shall be replaced as directed without extra cost to the Owner.
- E. All equipment supports shall be designed and constructed such that the equipment will be capable of resisting both vertical and horizontal movement. The equipment shall be positively anchored to the bases or supports to resist vertical movement. The equipment and its supports shall be provided with suitable restraints to resist horizontal movement from any direction as dictated by applicable seismic Codes.

1.19 SLEEVES, INSERTS, AND ANCHOR BOLTS

- A. The Contractor shall provide, set in place, and be held responsible for the location of all sleeves, inserts, and anchor bolts required for the work. In the event that failure to do so requires cutting and patching of finished work, it shall be done at the Contractor's expense.
 - 1. It is the responsibility of the Contractor to furnish cast-in-place sleeves, inserts, and anchors in sufficient time to be installed during initial concrete pours. Where job schedules make this impossible, coordinate and obtain acceptance from the Engineer for alternate installation methods.
- B. All pipes and conduits passing through floors, walls, or partitions shall be provided with sleeves having an inside diameter 1-inch larger than the outside diameter of the pipe, conduit, or insulation enclosing the pipe.

- C. Penetrations through fire-rated walls, ceilings, and all floors (except slab-on-grade) in which piping, or ducts pass shall be filled solidly with acceptable fire-stopping material.
- D. When ducts, piping, or conduit penetrate the floor of a mechanical room located above an occupied space, such penetrations shall be made completely watertight, such that a liquid leak shall not pass through the penetration.

1.20 FIRESTOPS AND SEALS

- A. Refer to Section 078413 “Penetration Firestopping” for additional and more specific information and ASTM E 814 and F&T Ratings.
- B. Firestopping systems shall be submitted as shop drawing.
- C. Penetrations through fire-rated walls, ceiling, or floors shall be sealed with a UL approved firestop fitting classified for an hourly rating equivalent to the fire rating of the wall, ceiling, or floor.
- D. Through wall and floor seals shall be used to provide a positive means of sealing pipes or ducts which pass through the concrete foundation of a structure below grade or below ground water level. Seals shall also be used at entry points through concrete walls or floors which must be sealed.
- E. All piping and conduit penetrations through the roof shall be provided with Pate Type PCA pipe curb assemblies or acceptable equivalent. Coordinate installation details with the roofing system being used for the project.

1.21 CUTTING AND PATCHING

- A. All cutting and patching shall be done per Division 01 requirements. The Contractor shall furnish sketches showing the location and sizes of all openings, chases, etc., required for the installation of work.
- B. Work under this Division shall include furnishing, locating, and setting inserts and/or sleeves required before the floors and walls are built or be responsible for cutting, drilling, or chopping where sleeves and inserts were not installed or correctly located. The Contractor shall do all drilling required for the installation of hangers.
- C. Exercise extreme caution when core drilling or punching openings in concrete floor slabs in order to avoid cutting or damaging structural members. No structural members or structural slabs/floors shall be cut without the written acceptance of a Structural Engineer and all such cutting shall be done in a manner directed by him.

1.22 SCAFFOLDING, RIGGING, AND HOISTING

- A. The Contractor shall furnish all scaffolding, rigging, hoisting, and services necessary for erection and delivery into the premises any equipment and apparatus furnished under this Division. Remove same from premises when no longer required.

1.23 WATERPROOFING

- A. Where any work pierces waterproofing, including waterproof concrete and floors in wet areas, the method of installation shall be reviewed by the Engineer before work is done. The Contractor shall furnish all necessary sleeves, caulking, and flashing required to make openings watertight.

1.24 ACCESSIBILITY AND ACCESS PANELS

- A. The Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate thickness of partitions, and the adequate clearance in double partitions and hung ceilings for the proper installation of the work.
- B. Locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment shall include, but not be limited to motors, controllers, coil, valves, switchgear, drain points, etc. Access doors shall be furnished if required for better accessibility. Minor deviations from the Drawings may be made to allow better accessibility, but changes of magnitude or which involve extra cost shall not be made without the acceptance of the Engineer.
- C. Access doors in walls, ceilings, floors, etc., shall be field coordinated. It is the responsibility of the Contractor to coordinate and provide information regarding the sizes and quantities of access doors required for his work. The Contractor shall arrange his work in such a manner as to minimize the quantity of access doors required, such as grouping shutoff valves in the same area. Where possible, locate valves in already accessible areas, such as lay-in ceilings, etc.
- D. On a clean set of prints, the Contractor shall mark in red pencil the location of each required access door, including its size and fire rating (if any), and shall submit the print to the Architect for review before access doors are purchased or installed.
- E. Upon completion of the Project, the Contractor shall physically demonstrate that all equipment and devices installed have been located and/or provided with adequate access panels for repair, maintenance, and/or operation. Any equipment not so furnished shall be relocated or provided with additional access panels by the installing Contractor at no additional cost to the Owner.
- F. Permanent ladders for access to equipment when shown on Plans shall be furnished and installed. Coordinate exact requirements in field.

1.25 TEMPORARY OPENINGS

- A. The Contractor shall ascertain from an examination of the Drawings whether any special temporary openings in the building will be required for the admission of apparatus provided under this Division and shall coordinate the requirements accordingly. In the event of failure of the Contractor to give sufficient notice in time to arrange for these openings during construction, the Contractor shall assume all costs of providing such openings thereafter.

1.26 SHUTDOWNS

- A. When installation of a new system requires the temporary shutdown of an existing operating system, the connection of the new system shall be performed at such time as designated by the Owner's representative.

- B. The Engineer and the Owner shall be notified of the estimated duration of the shutdown period at least ten (10) days in advance of the date the work is to be performed.
- C. Work shall be arranged for continuous performance whenever possible. The Contractor shall provide all necessary labor, including overtime if required, to assure that existing operating services will be shut down only during the time required to make necessary connections.

1.27 TAGS AND CHARTS

- A. Each valve and piece of apparatus under this Division shall be provided with suitable brass or laminated plastic tags and ceiling tag securely fastened with brass chains, screws, or rivets. Equipment shall be numbered with laminated plastic tags or neatly stenciled letters 2 inches high using designations in equipment schedules and/or shall conform to a directory indicating number, location, and use of each item. Directories shall be prepared under each Section and shall be glass framed.
 - 1. Directory shall indicate valve tag number and the unit number, floor/area branch line, main line, service, or other pertinent data to quickly and easily identify the valve's purpose.

1.28 ESCUTCHEONS

- A. The Contractor shall provide escutcheons on pipes wherever they pass through floors, ceilings, walls, or partitions in finished visible locations. See Section 078413 "Penetration Firestopping" for further requirements.

1.29 PAINTING

- A. All finish painting in completed areas shall be performed per Division 09 of the Specifications.
- B. All materials shipped to the job site under this Division, such as grilles, registers, and/or radiation covers, shall have standard manufacturer's finish, unless otherwise specified.
- C. The Contractor shall paint the interior of all ducts wherever the interior of the duct can be seen through a register or louver. Paint shall be flat black, rust preventative type.
- D. The Contractor shall paint conduits, pipe, and equipment wherever it can be seen through a register or louver. Paint shall not cover-up labels and other identifying items. Paint shall be flat black, rust preventative type.
- E. All uninsulated outdoor piping and fittings shall be properly primed with zinc-rich primer and finished with a minimum of two (2) coats of high-grade exterior enamel.

1.30 PIPE EXPANSION

- A. All pipe connections shall be installed to allow for freedom of movement of the piping during expansion and contraction without springing. Provide engineered design, layout, details, and fabrication, submitted with registered professional engineer sign and seal, of swing joints, expansion loops, and expansion joints with proper anchors and guides. Pay particular attention to plastic piping with high coefficients of expansion.

1. Consideration of required seismic lateral restraints shall be given when anchoring piping and making provision for expansion.

1.31 ELECTRICAL CONNECTIONS

- A. Unless otherwise specified, all wiring shall be furnished and installed per Division 26 Specifications.
- B. The Contractor furnishing equipment shall furnish the motor controller required for the equipment. Provide properly sized overload heaters and all required accessories with all motor controllers.
- C. All power wiring shall be furnished and installed per Division 26 complete from power source to motor or equipment junction box including power wiring through the motor controller and proper means of disconnect per NEC and Division 26. The Division 26 Contractor shall provide all disconnects, unless noted otherwise.

1.32 QUIET OPERATION

- A. Equipment and material used in the various systems described herein shall not produce a sound level greater than 55 decibels in the area served. If noise level is deemed objectionable by the Owner/Engineer, the Contractor shall test and record sound levels in the presence of the Owner/Engineer. The sound level shall be observed on the "A" weighting network of a sound level or sound survey meter. The ASHRAE "Guide and Data Book" provides a means to determine sound level of mechanical equipment when the total of background plus equipment sound levels exceeds the minimum acceptable equipment sound level.
- B. If objectionable noises or vibrations of any magnitude are produced and transmitted to occupied portions of the building by apparatus, piping, ducts, or other parts of the mechanical work, the Contractor shall make such changes or additions as necessary without extra cost to the Owner.

1.33 MAINTENANCE

- A. The Contractor shall provide the necessary skilled labor to assure the proper operation and to provide all required current and preventative maintenance for all equipment and controls provided under this Division until final acceptance of the building by the Owner. The Contractor shall not assume acceptance of the building by the Owner until he receives written notification.
- B. The Contractor shall receive calls for any and all problems experienced in the operation of the equipment provided under this Division and he shall take steps to immediately correct any deficiencies that may exist.
- C. The Contractor shall provide a check list and shall put a copy of it in the boiler or main mechanical room. The check list shall itemize each piece of equipment furnished under his Section.
 1. The Contractor shall certify on this check list that he has examined each piece of equipment and that, in his opinion, it is operating as intended by the manufacturer, it has been properly lubricated, and that all necessary current and preventative maintenance has been performed as recommended by the manufacturer and by good and accepted practice.

- D. Where normal preventative maintenance for any piece of equipment requires special tools, the Contractor shall furnish the appropriate tools for that piece of equipment (i.e., special filter removal hooks, valve wrenches, etc.).

1.34 LUBRICATION

- A. All equipment installed under this Contract having moving parts and requiring lubrication shall be properly lubricated according to manufacturer's recommendations prior to testing and operation. Any such equipment discovered to have been operated before lubrication by the Contractor is subject to rejection and replacement at no additional cost to the Owner. Units furnished with sealed bearings are exempted.
- B. The Contractor shall furnish and install, as appropriate on all equipment requiring lubrication, Zerk pressure gun grease fittings or sight gravity-feed oilers equipped with shutoff and needle valve adjustment. Units furnished with sealed bearings and lifetime lubrication are exempted. All fittings and oilers are to be fully accessible for lubrication with equipment which does not require special adapters. Where fittings would be otherwise inaccessible, furnish and install extended grease lines.

1.35 CLEANING

- A. The Contractor shall be responsible for keeping the jobsite clean, safe, and neat throughout the duration of construction. The Contractor shall clean up his own debris daily and shall coordinate removal of rubbish and debris with the General Contractor/Construction Manager.
 - 1. No debris, construction materials, cigarette butts, coffee cups, etc., shall be left above suspended ceilings.
- B. The Contractor shall thoroughly clean and flush all piping and equipment of all foreign substances, oils, burrs, solder, flux, etc., inside and out before being placed in operation.
- C. If any part of a system should be stopped or damaged by any foreign matter after being placed in operation, the system shall be disconnected, cleaned, and reconnected wherever necessary to locate and/or remove obstructions. Any work damaged while removing obstructions shall be repaired or replaced when the system is reconnected at no additional cost to the Owner.
- D. During the course of construction, all ducts and pipes shall be capped in an acceptable manner to insure adequate protection against the entrance of foreign matter.
- E. Upon completion of all work under the Contract, the Contractor shall remove from the premises all rubbish, debris, and excess materials left over from his work. Any oil or grease stains on floor areas caused by the Contractor shall be removed and floor areas left clean.

1.36 OPERATING INSTRUCTIONS

- A. Refer to Section 017823 "Operation and Maintenance Data".
- B. Upon completion of all work and tests, the Contractor shall furnish the necessary skilled labor and helpers for operating his system and equipment for a period specified under each applicable Section of this Division. During this period, he shall fully instruct the Owner or the Owner's representative in the operation, adjustment, and maintenance of all equipment furnished. The

Contractor shall give at least 72 hours' notice to the Owner and the Engineer in advance of this period.

- C. The Contractor shall formally submit for delivery to the Engineer three (3) complete bound sets of typewritten or blueprinted instructions for operating and maintaining all systems and equipment included in this Division. All instructions shall be submitted in draft for review prior to final issue. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instruction.
- D. The Contractor, in the above-mentioned instructions, shall include the maintenance schedule for the principal items of equipment furnished under this Division.
- E. The appropriate Contractor shall physically demonstrate procedures for all routine maintenance of all equipment furnished under each respective Section to assure accessibility to all devices.
- F. An authorized manufacturer's representative shall attest in writing that the equipment has been properly installed prior to startup of any major equipment. The following equipment will require this inspection: pumps; air conditioning equipment, controls, air handling equipment, boilers. These letters will be bound into the operating and maintenance books.
- G. Refer to individual trade Sections for any other particular requirements related to operating instructions.

1.37 ADJUSTING AND TESTING

- A. After all the equipment and accessories to be furnished are in place, they shall be put in final adjustment and subjected to such operating tests to assure the Engineer that they are in proper adjustment and in satisfactory, permanent operating condition.
- B. Where requested by the Engineer, a factory-trained service engineering representative shall inspect the installation and assist in the initial startup and adjustment to the equipment. The period of these services shall be for such time as necessary to secure proper installation and adjustments. After the equipment is placed in permanent operation, the service engineering representative shall supervise the initial operation of the equipment and instruct the personnel responsible for operation and maintenance of the equipment. The service engineering representative shall notify the Contractor in writing that the equipment was installed according to manufacturer's recommendations and is operating as intended by the manufacturer. Refer to Section 017900 "Demonstration and Training".

1.38 GUARANTEES

- A. The Contractor shall guarantee all equipment, material and workmanship under these Specifications and the Contract for a period of one (1) year from the date of final acceptance by Owner, unless otherwise noted.
- B. During this guarantee period, all defects developing through faulty equipment, materials, or workmanship shall be corrected or replaced immediately by the Contractor without expense to the Owner. Such repairs or replacements shall be made to the Engineer's satisfaction.

GENERAL CONDITIONS FOR FIRE PROTECTION TRADE

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 220100

SECTION 211313 - WET-PIPE SPRINKLER 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. Pipes, fittings, and specialties.
 - 2. Cover system for sprinkler piping.
 - 3. Specialty valves.
 - 4. Sprinklers.
 - 5. Alarm devices.
 - 6. Manual control stations.
 - 7. Control panels.
 - 8. Pressure gages.

1.3 DEFINITIONS

- A. High-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure higher than standard 175 psig, but not higher than 250 psig.
- B. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175-psig maximum.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Delegated-Design Submittal: For wet-pipe sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Domestic water piping.
 - 2. Compressed air piping.
 - 3. HVAC hydronic piping.
 - 4. Items penetrating finished ceiling include the following:

- a. Lighting fixtures.
 - b. Air outlets and inlets.
 - B. Qualification Data: For qualified Installer and professional engineer.
 - C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
 - D. Welding certificates.
 - E. Fire-hydrant flow test report.
 - F. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
 - G. Field quality-control reports.
- 1.6 CLOSEOUT SUBMITTALS
- A. Operation and Maintenance Data: For wet-pipe sprinkler systems and specialties 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. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six (6) spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.
- 1.8 QUALITY ASSURANCE
- A. Installer Qualifications:
 - 1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
 - a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.
 - B. Welding Qualifications: Qualify procedures and operators according to 2010 ASME Boiler and Pressure Vessel Code.

1.9 FIELD CONDITIONS

- A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:
 - 1. Notify Architect no fewer than seven (7) days in advance of proposed interruption of sprinkler service.
 - 2. Do not proceed with interruption of sprinkler service without Architect's written permission.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
 - 1. NFPA 13.
- B. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.
- C. High-Pressure Piping System Component: Listed for 250-psig minimum working pressure.
- D. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design wet-pipe sprinkler systems.
 - 1. Sprinkler system design shall be approved by authorities having jurisdiction.
 - a. Margin of Safety for Available Water Flow and Pressure: Twenty percent (20%), including losses through water-service piping, valves, and backflow preventers.
 - b. Sprinkler Occupancy Hazard Classifications:
 - 1) Automobile Parking Areas: Ordinary Hazard, Group 1.
 - 2) Building Service Areas: Ordinary Hazard, Group 1.
 - 3) Churches: Light Hazard.
 - 4) Electrical Equipment Rooms: Ordinary Hazard, Group 1.
 - 5) Dry Cleaners: Ordinary Hazard, Group 2.
 - 6) General Storage Areas: Ordinary Hazard, Group 1.
 - 7) Laundries: Ordinary Hazard, Group 1.
 - 8) Libraries except Stack Areas: Light Hazard.
 - 9) Library Stack Areas: Ordinary Hazard, Group 2.
 - 10) Machine Shops: Ordinary Hazard, Group 2.
 - 11) Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
 - 12) Office and Public Areas: Light Hazard.
 - 13) Plastics Processing Areas: Extra Hazard, Group 2.
 - 14) Printing Plants: Extra Hazard, Group 1.
 - 15) Repair Garages: Ordinary Hazard, Group 2.
 - 16) Residential Living Areas: Light Hazard.
 - 17) Restaurant Service Areas: Ordinary Hazard, Group 1.

- 18) Solvent Cleaning Areas: Extra Hazard, Group 2.
 - 19) Upholstering Plants: Extra Hazard, Group 1.
- 2. Minimum Density for Automatic-Sprinkler Piping Design:
 - a. Residential (Dwelling) Occupancy: 0.05 gpm over 400-sq. ft. area.
 - b. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
 - c. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
 - d. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area.
 - e. Extra-Hazard, Group 1 Occupancy: 0.30 gpm over 2500-sq. ft. area.
 - f. Extra-Hazard, Group 2 Occupancy: 0.40 gpm over 2500-sq. ft. area.
 - g. Special Occupancy Hazard: As determined by authorities having jurisdiction.
 - 3. Minimum Density for Deluge-Sprinkler Piping Design:
 - a. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over entire area.
 - b. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over entire area.
 - c. Extra-Hazard, Group 1 Occupancy: 0.30 gpm over entire area.
 - d. Extra-Hazard, Group 2 Occupancy: 0.40 gpm over entire area.
 - e. Special Occupancy Hazard: As determined by authorities having jurisdiction.
 - 4. Maximum Protection Area per Sprinkler:
 - a. Residential Areas: 400 sq. ft.
 - b. Office Spaces: 225 sq. ft.
 - c. Storage Areas: 130 sq. ft.
 - d. Mechanical Equipment Rooms: 130 sq. ft.
 - e. Electrical Equipment Rooms: 130 sq. ft.
 - f. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.
- E. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

2.2 STEEL PIPE AND FITTINGS

- A. Standard-Weight, Galvanized and Black-Steel Pipe: ASTM A 53, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.
- B. Schedule 40, Galvanized and Black-Steel Pipe: ASTM A 53; Schedule 40 in 2-inch and smaller.
- C. Schedule 10, Galvanized and Black-Steel Pipe: ASTM A 135 or ASTM A 795, Schedule 10 in 2½ inches and larger; and NFPA 13-specified wall thickness in NPS 6 to NPS 10, plain end.
- D. Galvanized and Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53, standard-weight, seamless steel pipe with threaded ends.
- E. Galvanized and Uncoated-Steel Couplings: ASTM A 865, threaded.
- F. Galvanized and Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

- G. Malleable- or Ductile-Iron Unions: UL 860.
- H. Cast-Iron Flanges: ASME 16.1, Class 125.
- I. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.
 - 1. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8-inch-thick ASME B16.21, nonmetallic and asbestos free or EPDM rubber gasket.
 - a. Class 125 and Class 250, Cast-Iron, Flat-Face Flanges: Full-face gaskets.
 - b. Class 150 and Class 300, Ductile-Iron or -Steel, Raised-Face Flanges: Ring-type gaskets.
 - 2. Metal, Pipe-Flange Bolts and Nuts: Carbon steel unless otherwise indicated.
- J. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.
 - 1. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- K. Grooved-Joint, Steel-Pipe Appurtenances:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Anvil International, Inc.
 - b. Shurjoint Piping Products
 - c. Tyco Fire & Building Products LP
 - d. Victaulic Company
 - 2. Pressure Rating: 175-psig minimum.
 - 3. Galvanized, Painted, and Uncoated Grooved-End Fittings for Steel Piping: ASTM A 47, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.
 - 4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.3 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L and ASTM B 88, Type M water tube, drawn temper.
- B. Cast-Copper, Solder-Joint Fittings: ASME B16.18 pressure fittings.
- C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22 pressure fittings.
- D. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.
- E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

- F. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

2.4 SPECIALTY VALVES

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- B. Pressure Rating:
 - 1. Standard-Pressure Piping Specialty Valves: 175-psig minimum.
 - 2. High-Pressure Piping Specialty Valves: 250-psig.
- C. Body Material: Cast or ductile iron.
- D. Size: Same as connected piping.
- E. End Connections: Flanged or grooved.
- F. Alarm Valves:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:
 - a. Globe Fire Sprinkler Corporation
 - b. Reliable Automatic Sprinkler Co., Inc.
 - c. Tyco Fire & Building Products LP
 - d. Victaulic Company
 - 2. Standard: UL 193.
 - 3. Design: For horizontal or vertical installation.
 - 4. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gages, retarding chamber, and fill-line attachment with strainer.
 - 5. Drip Cup Assembly: Pipe drain without valves and separate from main drain piping.
 - 6. Drip Cup Assembly: Pipe drain with check valve to main drain piping.
 - 7. 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.
- G. Automatic (Ball Drip) Drain Valves:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AFAC Inc.
 - b. Reliable Automatic Sprinkler Co., Inc.
 - c. Tyco Fire & Building Products LP
 - 2. Standard: UL 1726.
 - 3. Pressure Rating: 175-psig minimum.
 - 4. Type: Automatic draining, ball check.

5. Size: NPS 3/4.
6. End Connections: Threaded.

2.5 SPRINKLER PIPING SPECIALTIES

A. Branch Outlet Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Anvil International, Inc.
 - b. National Fittings, Inc.
 - c. Shurjoint Piping Products
 - d. Tyco Fire & Building Products LP
 - e. Victaulic Company
2. Standard: UL 213.
3. Pressure Rating: 175-psig minimum.
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-tee and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. AGF Manufacturing Inc.
 - b. Reliable Automatic Sprinkler Co., Inc.
 - c. Tyco Fire & Building Products LP
 - d. Victaulic Company
2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum.
4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded or grooved.

C. Sprinkler Inspector's Test Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. AGF Manufacturing Inc.
 - b. Triple R Specialty
 - c. Tyco Fire & Building Products LP
 - d. Victaulic Company

2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum.
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

D. Flexible Sprinkler Hose Fittings:

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. Fivalco Inc.
 - b. FlexHead Industries, Inc.
 - c. Gateway Tubing, Inc.
 - d. Victaulic Company
2. Standard: UL 1474.
3. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
4. Pressure Rating: 175-psig minimum.
5. Size: Same as connected piping, for sprinkler.

2.6 SPRINKLERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
1. AFAC Inc.
 2. Globe Fire Sprinkler Corporation
 3. Reliable Automatic Sprinkler Co., Inc.
 4. Tyco Fire & Building Products LP
 5. Victaulic Company
- B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- C. Pressure Rating for Automatic Sprinklers: 175-psig minimum.
- D. Automatic Sprinklers with Heat-Responsive Element:
1. Early-Suppression, Fast-Response Applications: UL 1767.
 2. Nonresidential Applications: UL 199.
 3. Residential Applications: UL 1626.
 4. Characteristics: Nominal ½-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.
- E. Open Sprinklers with Heat-Responsive Element Removed: UL 199.
1. Nominal Orifice: ½-inch, with discharge coefficient K between 5.3 and 5.8.
 2. Nominal Orifice: 17/32-inch with discharge coefficient K between 7.4 and 8.2.

- F. Sprinkler Finishes: Coordinate with Architect prior to installation.
- G. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
 - 1. Ceiling Mounting: Chrome-plated steel, one-piece, flat.
 - 2. Sidewall Mounting: Chrome-plated steel, one-piece, flat.
- H. Sprinkler Guards:
 - 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. Reliable Automatic Sprinkler Co., Inc.
 - b. Tyco Fire & Building Products LP
 - c. Victaulic Company
 - 2. Standard: UL 199.
 - 3. Type: Wire cage with fastening device for attaching to sprinkler.

2.7 ALARM DEVICES

- A. Alarm-device types shall match piping and equipment connections.
- B. Electrically Operated Alarm Bell:
 - 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. Fire-Lite Alarms, Inc.; a Honeywell company
 - b. Notifier; a Honeywell company
 - c. Potter Electric Signal Company
 - 2. Standard: UL 464.
 - 3. Type: Vibrating, metal alarm bell.
 - 4. Size: 6-inch minimum-diameter.
 - 5. Finish: Red-enamel factory finish, suitable for outdoor use.
 - 6. 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. Water-Flow Indicators:
 - 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. ADT Security Services, Inc.
 - b. McDonnell & Miller; ITT Industries

- c. Potter Electric Signal Company
 - d. System Sensor; a Honeywell company
 - e. Watts Industries (Canada) Inc.
2. Standard: UL 346.
 3. Water-Flow Detector: Electrically supervised.
 4. Components: Two (2) single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
 5. Type: Paddle operated.
 6. Pressure Rating: 250 psig.
 7. Design Installation: Horizontal or vertical.

D. Pressure Switches:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AFAC Inc.
 - b. Barksdale, Inc.
 - c. Detroit Switch, Inc.
 - d. Potter Electric Signal Company
 - e. System Sensor; a Honeywell company
 - f. Tyco Fire & Building Products LP
 - g. United Electric Controls Co.
2. Standard: UL 346.
3. Type: Electrically supervised water-flow switch with retard feature.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design Operation: Rising pressure signals water flow.

E. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fire-Lite Alarms, Inc.; a Honeywell company
 - b. Kennedy Valve; a division of McWane, Inc.
 - c. Potter Electric Signal Company
 - d. System Sensor; a Honeywell company
2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.
6. 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

2.8 MANUAL CONTROL STATIONS

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide" for hydraulic operation, with union, NPS 1/2 pipe nipple, and bronze ball valve.
- B. Include metal enclosure labeled "MANUAL CONTROL STATION," with operating instructions and cover held closed by breakable strut to prevent accidental opening.

2.9 CONTROL PANELS

- A. Description: Single-area, two-area, or single-area cross-zoned control panel as indicated, including NEMA ICS 6, Type 1 enclosure, detector, alarm, and solenoid-valve circuitry for operation of deluge valves.
 - 1. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide" when used with thermal detectors and Class A detector circuit wiring.
 - 2. Electrical characteristics are 120-V ac, 60 Hz, with 24-V dc rechargeable batteries.
 - 3. 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. Manual Control Stations: Electric operation, metal enclosure, labeled "MANUAL CONTROL STATION," with operating instructions and cover held closed by breakable strut to prevent accidental opening.
- C. Manual Control Stations: Hydraulic operation, with union, NPS 1/2 pipe nipple, and bronze ball valve. Include metal enclosure labeled "MANUAL CONTROL STATION," with operating instructions and cover held closed by breakable strut to prevent accidental opening.
- D. Panels Components:
 - 1. Power supply.
 - 2. Battery charger.
 - 3. Standby batteries.
 - 4. Field-wiring terminal strip.
 - 5. Electrically supervised solenoid valves and polarized fire-alarm bell.
 - 6. Lamp test facility.
 - 7. Single-pole, double-throw auxiliary alarm contacts.
 - 8. Rectifier.

2.10 PRESSURE GAGES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AMETEK; U.S. Gauge Division
 - 2. Ashcroft, Inc.
 - 3. Brecco Corporation
 - 4. WIKA Instrument Corporation
- B. Standard: UL 393.

- C. Dial Size: 3½- to 4½-inch diameter.
- D. Pressure Gage Range: 0- to 250-psig minimum.
- E. Label: Include "WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.
- B. Report test results promptly and in writing.

3.2 SERVICE-ENTRANCE PIPING

- A. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping.
- B. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.3 WATER-SUPPLY CONNECTIONS

- A. Connect sprinkler piping to building's interior water-distribution piping. Comply with requirements for interior piping in Section 221116 "Domestic Water Piping."
- B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-distribution piping.
- C. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

3.4 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
 - 2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.
- B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.
- C. Install seismic restraints on piping. Comply with NFPA 13 requirements for seismic-restraint device materials and installation.
- D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

- E. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.
- H. Install sprinkler piping with drains for complete system drainage.
- I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- J. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.
- K. Install alarm devices in piping systems.
- L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.
- M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal and install where they are not subject to freezing.
- N. Fill sprinkler system piping with water.
- O. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.5 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.
- I. Steel-Piping, Pressure-Sealed Joints: Join lightwall steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.
- J. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
 - 1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.
- K. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- L. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- M. Steel-Piping, Pressure-Sealed Joints: Join Schedule 5 steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.
- N. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Braze Joints" Chapter.
- O. Copper-Tubing Grooved Joints: Roll rounded-edge groove in end of tube according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- P. Copper-Tubing, Pressure-Sealed Joints: Join copper tube and copper pressure-seal fittings with tools recommended by fitting manufacturer.
- Q. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.
- R. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.
- S. Plastic-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
2. CPVC Piping: Join according to ASTM D 2846 Appendix.

3.6 INSTALLATION OF COVER SYSTEM FOR SPRINKLER PIPING

- A. Install cover system, brackets, and cover components for sprinkler piping according to manufacturer's "Installation Manual" and NFPA 13 or NFPA 13R for supports.

3.7 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Specialty Valves:
 1. Install valves in vertical position for proper direction of flow, in main supply to system.
 2. Install alarm valves with bypass check valve and retarding chamber drain-line connection.
 3. Install deluge valves in vertical position, in proper direction of flow, and in main supply to deluge system. Install trim sets for drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.

3.8 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.
- B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.
- C. Install sprinklers into flexible, sprinkler hose fittings, and install hose into bracket on ceiling grid.

3.9 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.10 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.
6. Coordinate with fire-pump tests. Operate as required.
7. Verify that equipment hose threads are same as local fire department equipment.

B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.11 CLEANING

A. Clean dirt and debris from sprinklers.

B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.12 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specialty valves and pressure-maintenance pumps.

3.13 PIPING SCHEDULE

A. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with grooved ends, grooved-end fittings, grooved-end-pipe couplings, and grooved joints.

B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.

C. Copper-tube, extruded-tee connections may be used for tee branches in copper tubing instead of specified copper fittings. Branch-connection joints must be brazed.

D. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller, shall be one (1) of the following:

1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Schedule 40, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
3. Schedule 40, black-steel pipe with plain ends; steel welding fittings; and welded joints.

E. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 to NPS 4, shall be one (1) of the following:

1. Schedule 10, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 2. Schedule 40, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
 3. Schedule 10, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 4. Schedule 40, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
- F. Standard-pressure, wet-pipe sprinkler system, NPS 6 and larger, shall be one (1) of the following:
1. Schedule 10, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 2. Schedule 40, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
 3. Schedule 10, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 4. Schedule 40, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 5. Schedule 40, black-steel pipe with plain ends; steel welding fittings; and welded joints.

3.14 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:
1. Rooms without Ceilings: Upright sprinklers.
 2. Rooms with Suspended Ceilings: Pendent, recessed, flush, and concealed sprinklers as indicated.
 3. Wall Mounting: Sidewall sprinklers.
 4. Spaces Subject to Freezing: Upright, pendent, dry sprinklers; and sidewall, dry sprinklers as indicated.
- B. Provide sprinkler types in subparagraphs below with finishes indicated.
1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
 2. Flush Sprinklers: Bright chrome, with painted white escutcheon.
 3. Recessed Sprinklers: Bright chrome, with painted white escutcheon.

END OF SECTION 211313

SECTION 220100 - GENERAL CONDITIONS FOR PLUMBING TRADE

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. General Conditions, Supplementary Conditions and Division 01 paragraphs may be repeated in this Division for emphasis or for inclusion of more stringent/additional related requirements. Such repetition shall not be construed to reduce the requirements of those Divisions nor to eliminate other requirements under those Divisions.

1.2 DESCRIPTION

- A. The General Conditions are a part of this Division and are to be considered a part of this Contract.
- B. Where items of the General Conditions are repeated in other Sections of the Specifications, it is merely intended to qualify or to call particular attention to them. It is not intended that any other parts of the General Conditions shall be assumed to be omitted if not repeated therein.
- C. This Section applies equally and specifically to all Contractors supplying labor and/or equipment and/or materials as required under each Section of Division 22.
- D. The following information contains specifications of Work in connection with, and in addition to, this Division:
 - 1. All drawings associated with the project.
 - 2. All specifications associated with the project.
- E. Divisions of work responsibilities shall be defined and directed by the General Contractor or Construction Manager.

1.3 INTENT

- A. It is the intent of the Specifications and Drawings to call for finished work, tested and ready for operation.
- B. Furnish, deliver, and install any apparatus, appliance, material, or work not shown on Drawings but mentioned in the Specifications, or vice versa, or any incidental accessories necessary to make the Work complete and perfect in all respects and ready for operation, even if not particularly specified, under their respective Section without additional expense to the Owner.
- C. Include in the work minor details not usually shown or specified but necessary for proper installation and operation, as though they were hereinafter shown or specified.
- D. Provide Engineer written notice of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules, or regulations of authorities having jurisdiction; and any

necessary items of Work omitted. In the absence of such written notice, it is mutually agreed that Work under each Section has included the cost of all required items for the accepted, satisfactory functioning of the entire system without extra compensation.

- E. The Work indicated is diagrammatic. The Architect and/or Engineer may require as part of this Contract, the relocation of devices to reasonable distances from the general locations shown.

1.4 DRAWINGS

- A. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. (Do not scale the Drawings.) Consult the Architectural Drawings and Details for exact location of fixtures and equipment; where same are not definitely located, obtain this information from the Architect.
- B. Closely follow Drawings in layout of Work; check Drawings of other Divisions to verify spaces in which work will be installed. Maintain maximum headroom. Where space conditions appear inadequate, Engineer shall be notified before proceeding with installations.
- C. Engineer may, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades and/or for proper execution of the work.
- D. Where variances occur between the Drawings and Specifications or within either of the Documents, include the item or arrangement of better quality, greater quantity, or higher cost in the Contract price. The Engineer shall decide on the item and the way the work shall be installed.

1.5 SURVEYS AND MEASUREMENTS

- A. Before submitting a Bid, the Contractor shall visit the site and shall become thoroughly familiar with all conditions under which the work will be installed. Contractor will be held responsible for any assumptions, omissions, or errors made because of failure to become familiar with the site and the Contract Documents.
- B. Base all measurements, both horizontal and vertical, from established benchmarks. All Work shall agree with these established lines and levels. Verify all measurements at the site and check the correctness of same as related to the Work.
- C. Should the Contractor discover any discrepancies between actual measurements and those indicated which prevent following good practice or the intent of the Drawings and Specifications, notify the Engineer to not proceed with that Work until instructions have been received from the Engineer.

1.6 CODES AND STANDARDS

- A. The Codes and Standards listed below apply to all Work. Where Codes or Standards are mentioned in these Specifications, follow the latest edition or revision.
- B. The current adopted editions of the following State or local Codes apply:

2018 Connecticut State Building Code (CSBC) including portions of the 2015 International Building Code

2018 Connecticut State Fire Code
2018 Connecticut State Fire Safety Code including portions of the 2015 International Fire Code (CSFSC)
2015 NFPA 101 Life Safety Code (NFPA101)
2015 Connecticut Fire Prevention Code (CFPC)
2015 NFPA 1 Fire Code (NFPA101)
2015 International Plumbing Code and referenced publications
2015 International Mechanical Code and referenced publications NFPA 54/2015, National Fuel Gas Code
NFPA 70/2017, National Electrical Code
NFPA 72/2013, National Fire Alarm Code
AWWA Standards
Factory Mutual Approval Guide: latest edition
Pipe Hangers and Supports: MSS SP-58
UL Compliance
The American National Standards Institute (ANSI) A117.1/2009
Local Building Code

C. The following Standards shall be used where referenced by the following abbreviations:

AABC Associated Air Balance Council
ACGIH American Conference of Governmental Industrial Hygienists
ADC Air Diffusion Council
AGA American Gas Association
AIA American Institute of Architects
AMCA Air Moving and Conditioning Association
ANSI American National Standards Institute
API American Petroleum Institute
ARI Air Conditioning and Refrigeration Institute
ASE Association of Safety Engineers
ASHRAE American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME American Society of Mechanical Engineers
ASPE American Society of Plumbing Engineers
ASTM American Society of Testing and Materials
AWS American Welding Society
AWWA American Water Works Association
CGA Compressed Gas Association
CSA Canadian Standards Association
CISPI Cast Iron Soil Pipe Institute
EJMA Expansion Joint Manufacturing Association
EPA Environmental Protection Agency
FM Factory Mutual Insurance Association
FSSC Federal Specification
HIS Hydraulic Institute Standards
IBR Institute of Boiler and Radiator Manufacturers
IEEE Institute of Electrical and Electronics Engineers
IRI Industrial Risk Insurers
ISO Insurance Services Office
MCAA Mechanical Contractors Association of America
MSS Manufacturers Standardization Society
NBS National Bureau of Standards

NEBB National Environmental Balancing Bureau
NEMA National Electrical Manufacturers Association
NFPA National Fire Protection Association
NOFI National Oil Fuel Institute
NRC National Research Council
NSC National Safety Council
NSF National Sanitation Foundation
OSHA Occupational Safety and Health Administration
PDI Plumbing and Drainage Institute
SAMA Scientific Apparatus Manufacturers Association
SBI Steel Boiler Industry (Division of Hydronics Institute)
SMACNA Sheet Metal and Air Conditioning Contractors National Association
STI Steel Tank Institute
UL Underwriters' Laboratories

- D. All materials furnished and all work installed shall comply with the rules and recommendations of the NFPA, the requirements of the local utility companies, the recommendations of the fire insurance rating organization having jurisdiction, and the requirements of all Governmental departments having jurisdiction.
- E. Include in the Work, without extra cost to the Owner, any labor, materials, services, apparatus, and Drawings to comply with all applicable laws, ordinances, rules, and regulations, whether shown on Drawings and/or specified.

1.7 PERMITS AND FEES

- A. Give all necessary notices, obtain all permits; pay all Government and State sales taxes and fees where applicable, and other costs, including utility connections or extensions in connection with the Work. File all necessary Drawings, prepare all Documents and obtain all necessary approvals of all Governmental and State departments having jurisdiction, obtain all required certificates of inspections for Work and deliver a copy to the Engineer before request for acceptance and final payment for the Work.

1.8 SEISMIC RESTRAINT

- A. General: This project is in a seismic zone per State and/or Local Codes and Ordinances and all materials and equipment shall be installed, supported, and seismically restrained accordingly. Verify current seismic requirements based on project location and with Code requirements.
- B. 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 vibration isolation bases and seismic restraints that are like those required for this Project in material, design, and extent.
- C. Shop Drawings: Show designs and calculations, certified by a professional engineer, for the following:
 - 1. Design Calculations: Calculations for selection of vibration isolators, design of vibration isolation bases, design of seismic supports, and selection of seismic restraints for all equipment and materials.

2. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to the structure and to the supported equipment. Include auxiliary motor slides and rails, and base weights.
 3. Seismic Restraint Details: Detail fabrication and attachment of restraints, supports, and snubbers.
- D. Installation: Installation shall be carried out in strict accordance with the Seismic Engineer's submittal, current Code, accepted standards, and the equipment and material manufacturers' recommendations.

1.9 COORDINATION

- A. Carry out all work in conjunction with other trades and give full cooperation in order that all Work may proceed with a minimum of delay and interference. Emphasis is placed on timely installation of major apparatus and furnishing other Contractors, especially the General Contractor or Construction Manager, with information as to openings, chases, sleeves, bases, inserts, equipment locations, panels, access doors, etc. required by other trades.
- B. Contractors are required to examine all the Project Drawings and mutually arrange Work to avoid interference. In general, ductwork, heating piping, sprinkler piping, and drainage lines take precedence over water, gas, and electrical conduits. The Engineer regarding the arrangement of Work, which cannot be agreed upon by the Contractors, will make final decisions.
- C. Where the Work of the Contractor will be installed near or will interfere with Work of other trades, assist in working out space conditions to make a satisfactory adjustment.
- D. If Work is installed before coordinating with other Divisions or to cause interference with Work of other Sections, the Contractor causing the interference will make necessary changes to correct the condition without extra charge to the Owner.
- E. Initial contact and coordination have been conducted with utility entities for the purpose of the preparation of Bid Documents. The Contractor shall coordinate all final specific utility requirements.

1.10 ACCEPTANCES

- A. The equipment, materials, Workmanship, design, and arrangement of all Work installed are subject to the review of the Engineer.
- B. Within thirty (30) days after the awarding of a Contract, submit to the Engineer for review a list of manufacturers of equipment proposed for the Work. The intent to use the exact makes specified does not relieve the Contractor of the responsibility of submitting such a list.
 1. If extensive or unacceptable delivery time is expected on a particular item of equipment specified, notify the Engineer, in writing, within thirty (30) days of the awarding of the Contract. In such instances, deviations may be made pending acceptance by the Engineer or the Owner's representative.
- C. Where any specific material, process, or method of construction or manufactured article is specified by reference to the catalog or model number of a manufacturer, the Specifications are

to be used as a guide and are not intended to take precedence over the basic duty and performance specified or noted on the Drawings. In all cases, verify the duty specified with the specific characteristics of the equipment offered for review. Equipment characteristics are to be used as mandatory requirements where the Contractor proposes to use an acceptable equivalent.

- D. If material or equipment is installed before shop drawing review, liability for its removal and replacement is assumed by the Contractor, at no extra charge to the Owner, if, in the opinion of the Engineer, the material or equipment does not meet the intent of the Drawings and Specifications.
- E. Failure on the part of the Engineer to reject shop drawings or to reject Work in progress shall not be interpreted as acceptance of Work not in conformance with the Drawings and/or Specifications. Correct Work not in conformance with the Drawings and/or Specifications whenever non-conformance is discovered.

1.11 EQUIPMENT DEVIATIONS

- A. Refer to Section 016000 "Product Requirements".
- B. Equipment, material, or devices submitted for review as an "accepted equivalent" shall meet the following requirements:
 - 1. The equivalent shall have the same construction features such as, but not limited to:
 - a. Material thickness, gauge, weight, density, etc.
 - b. Welded, riveted, bolted, etc., construction.
 - c. Finish, undercoatings, corrosion protection.
 - 2. The equivalent shall perform with the same or better operating efficiency.
 - 3. The equivalent shall have equal or greater reserve capacity.
 - 4. The equivalent shall be locally represented by the manufacturer for service, parts, and technical information.
 - 5. The equivalent shall bear the same labels of performance certification as is applicable to the specified item, such as AMCA or ARI labels.
- C. Where the Contractor proposes to use an item of equipment other than specified or detailed on the Drawings which requires any redesign of the structure, partitions, foundations, piping, wiring, or any other part of the mechanical, electrical, or architectural layout, all such redesign and all new drawings and detailing required therefore shall be prepared by the Designers of Record at the expense of the Contractor and at no additional cost to the Owner.
- D. Where such accepted deviation or substitution requires a different quantity and arrangement of piping, ductwork, valves, pumps, insulation, wiring, conduit, and equipment from that specified or indicated on the Drawings, the Contractor shall, with the acceptance by the Engineer, furnish and install any such additional equipment required by the system at no additional cost to the Owner, including any costs added to other trades due to the substitution.
- E. The Engineer shall determine if an "accepted equivalent" to a manufacturer listed in the Specifications is considered acceptable.

1.12 SHOP DRAWINGS

- A. Refer to individual specification sections for additional submittal information.
- B. All plumbing submittals shall be submitted in a single package. “Piece-Meal” or “Partial” submittals will not be accepted, and will be rejected and returned without review, unless prior approval from the Engineer has been obtained. NO EXCEPTIONS.
- C. Plumbing long lead items are excluded from requirement but must be submitted complete in their entirety by specification section, when provided.
- D. The Contractor shall submit for review detailed shop drawings of all equipment and material specified in each section and coordinated ductwork layouts. No material or equipment may be delivered to the job site or installed until the Contractor has received shop drawings for the material or equipment which have been carefully reviewed.
- E. Provide shop drawings for all devices specified under equipment specifications for all systems, materials, equipment, and/or devices. Shop drawings shall include manufacturers' names, catalog numbers, cuts, diagrams, and other such descriptive data as may be required to identify and accept the equipment. A complete list in each category (example: all fixtures) of all shop drawings, catalog cuts, material lists, etc., shall be submitted to the Engineer at one time. No consideration will be given to a partial shop drawing submittal.
 - 1. Equipment shop drawings shall contain full range performance curves, graphs, tables, or other pertinent data which clearly indicates operational range of a given unit size. Computer generated/plotted curves, based solely on design performance, will not be accepted.
 - 2. All specific options and/or alternatives shall be clearly indicated. Failure to do so shall be grounds for rejection.
- F. Submittals shall be marked with the trade involved, i.e., HVAC, plumbing, fire protection, etc. and the specific associated specification section.
- G. Where multiple quantities or types of equipment are being submitted, provide a cover sheet (with a list of contents) on the submittal identifying the equipment or material being submitted.
- H. Failure to submit shop drawings in ample time for review shall not entitle the Contractor to an extension of Contract time. No claim for extension by reason of such default will be allowed, nor shall the Contractor be entitled to purchase, furnish and/or install equipment which has not been reviewed by the Engineer. The Contractor shall incur all costs associated with delay of construction due to equipment and/or materials arriving late due to late or improper shop drawing submittal.
- I. The Contractor shall furnish all necessary templates, patterns, etc., for installation work and for the purpose of making adjoining work conform; furnish setting plans and shop details to other trades as required.
- J. Acceptance rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are reviewed, review does not indicate that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the

Contract Drawings and Specifications. Verify available space prior to submitting shop drawings.

- K. Acceptance of shop drawings shall not apply to quantity nor relieve Contractor of his responsibility to comply with intent of Drawings and Specifications.
- L. Acceptance of shop drawings is final, and no further changes will be allowed without the written consent of the Engineer.
- M. Shop drawing submittal sheets which may show items that are not being furnished shall have those items crossed off to clearly indicate which items will be furnished.
- N. Contractor shall make any corrections required by Engineer and shall resubmit required number of corrected copies of shop drawings or new samples until accepted. Contractor shall direct specific attention in writing or on resubmitted shop drawings to revisions other than corrections requested by Engineer on previous submissions. Engineer shall review no more than one (1) resubmittal of any shop drawing or sample at Owner's expense. The fees for review of additional resubmittals shall be paid by the Contractor at the Engineer's standard rates.
- O. Conform the plumbing work to the requirements herein. Provide offsets, fittings, drains, and accessories which may be required to accommodate structural, HVAC, plumbing, existing conditions, etc. Investigate the structural and finish conditions affecting the work and arrange the work accordingly. Provide such piping, fittings, valves, and accessories as may be required to meet such conditions.

1.13 CHANGES IN WORK

- A. Change Order is a written order to the Contractor signed by the Owner and the Architect, issued after Contracts have been awarded, authorizing a change in the work or an adjustment in the Contract sum or the Contract time. A Change Order signed by the Contractor indicates his agreement therewith, including the adjustment in the Contract sum or the Contract time.
- B. All changes in the work shall follow the recommendations of the AIA "General Conditions of the Contract for Construction", Article 7.

1.14 MANUFACTURER'S IDENTIFICATION

- A. All component parts of each item of equipment or device shall bear the manufacturer's nameplate giving name of manufacturer, description, size, type, serial and model number, electrical characteristics, etc., to facilitate maintenance or replacement. The nameplate of a Contractor or distributor will not be acceptable.
- B. All material and equipment for the electrical portion of the mechanical systems shall bear the label of or be listed by UL, or other accredited authoritative agencies or testing organizations approved by the authority having jurisdiction.

1.15 RECORD DRAWINGS

- A. Refer to Section 017700 "Project Closeout" for additional information. Maintain at the job site a record set of Mechanical Drawings on which any changes in location or routing of all equipment, materials, and access panels shall be recorded.

- B. At the end of construction, the Contractor shall provide the Owner with a complete set of As-Built Drawings, including all updated coordination drawings, ductwork, and piping plans. Prepare As-Built documentation utilizing the most recent version of AutoCAD.
- C. If electronic copies of the contract documents are made available to the Contractor for use in production of As-Built documentation, the Contractor assumes responsibility for completeness and accuracy of the As-Built documents. Translation or manipulation of electronic documents provided to the Contractor is the responsibility of the Contractor.

1.16 MATERIALS AND WORKMANSHIP

- A. All materials and apparatus required for the work, except as otherwise specifically indicated, shall be new, of first-class quality, and shall be furnished, delivered, erected, connected, and finished in every detail and be so selected and arranged as to fit properly into the building spaces. Where no specific type or quality of material is given, a first-class standard article as accepted by industry standards shall be furnished.
- B. The Contractor shall furnish the services of an experienced superintendent who shall be constantly in charge of the installation of the work together with all skilled workmen, fitters, metal workers, welders, helpers, and laborers required to unload, transfer, erect, connect, adjust, start, operate, and test each system.
- C. Unless otherwise specifically indicated on the Drawings or Specifications, all equipment and materials shall be installed with the acceptance of the Engineer and in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.
- D. All labor for installation of mechanical systems shall be performed by experienced, skilled tradesmen under the supervision of a licensed journeyman foreman. All work shall be of a quality consistent with good trade practice and shall be installed in a neat, workmanlike manner. The Engineer reserves the right to reject any work which has been installed in a substandard, dangerous, or unserviceable manner. The Contractor shall replace said work in a satisfactory manner at no extra cost to the Owner.

1.17 PROTECTION OF MATERIALS AND EQUIPMENT

- A. Work under each Section shall include protecting the work and material of all other Sections from damage by work or workmen and shall include making good all damage thus caused.
- B. The Contractor shall be responsible for work and equipment until the facility has been accepted by the Owner. Protect work against theft, injury, or damage and carefully store material and equipment received on site which is not immediately installed. Close open ends of work with temporary covers or plugs during construction to prevent entry of foreign material.
- C. Work under each Section includes receiving, unloading, uncrating, storing, protecting, setting in place, and completely connecting equipment supplied under each Section. Work under each Section shall also include exercising exceptional care in handling and protecting equipment and fixtures and shall include the cost of replacing any of the equipment and fixtures which are missing or damaged.

- D. Equipment and material stored on the job site shall be protected from the weather, vehicles, dirt and/or damage by workmen or machinery. Ensure that all electrical or absorbent equipment or material is protected from moisture during storage.

1.18 BASES AND SUPPORTS

- A. Unless otherwise specifically noted, the Contractor shall furnish all necessary supports, rails, framing, bases, and piers required for all equipment furnished under this Division.
- B. Unless otherwise indicated in individual trade Sections, pumps, fans, air handlers, boilers, chillers, tanks, compressors, and other rotating machinery shall be mounted on a minimum of 4-inch-high concrete pads which shall be furnished and installed per Division 03. All pads shall be extended not less than 4 inches beyond machine base in all directions and sufficient for seismic anchoring with top edge chamfered. Shop drawings of all foundations and pads shall be submitted to the Engineer for review before they are constructed. The Mechanical Contractor shall field coordinate all required dimensional and necessary loading information.
- C. Construction of foundations, supports, pads, bases, and piers where mounted on the floor shall be of the same finish quality as the adjacent and surrounding flooring material.
- D. Unless otherwise shown, all equipment shall be securely attached to the building structure in an acceptable manner. Attachments shall be of a strong and durable nature; any attachments that are insufficient, in the opinion of the Engineer, shall be replaced as directed without extra cost to the Owner.
- E. All equipment supports shall be designed and constructed such that the equipment will be capable of resisting both vertical and horizontal movement. The equipment shall be positively anchored to the bases or supports to resist vertical movement. The equipment and its supports shall be provided with suitable restraints to resist horizontal movement from any direction as dictated by applicable seismic Codes.

1.19 SLEEVES, INSERTS, AND ANCHOR BOLTS

- A. The Contractor shall provide, set in place, and be held responsible for the location of all sleeves, inserts, and anchor bolts required for the work. If failure to do so requires cutting and patching of finished work, it shall be done at the Contractor's expense.
 - 1. It is the responsibility of the Contractor to furnish cast-in-place sleeves, inserts, and anchors in sufficient time to be installed during initial concrete pours. Where job schedules make this impossible, coordinate and obtain acceptance from the Engineer for alternate installation methods.
- B. All pipes and conduits passing through floors, walls, or partitions shall be provided with sleeves having an inside diameter 1-inch larger than the outside diameter of the pipe, conduit, or insulation enclosing the pipe.
- C. Penetrations through fire-rated walls, ceilings, and all floors (except slab-on-grade) in which piping, or ducts pass shall be filled solidly with acceptable fire-stopping material.

- D. When ducts, piping, or conduit penetrate the floor of a mechanical room located above an occupied space, such penetrations shall be made completely watertight, such that a liquid leak shall not pass through the penetration.

1.20 FIRESTOPS AND SEALS

- A. Refer to Section 078413 “Penetration Firestopping” for additional and more specific information and ASTM E 814 and F&T Ratings.
- B. Firestopping systems shall be submitted as shop drawing.
- C. Penetrations through fire-rated walls, ceiling, or floors shall be sealed with a UL approved firestop fitting classified for an hourly rating equivalent to the fire rating of the wall, ceiling, or floor.
- D. Through wall and floor seals shall be used to provide a positive means of sealing pipes or ducts which pass through the concrete foundation of a structure below grade or below ground water level. Seals shall also be used at entry points through concrete walls or floors which must be sealed.
- E. All piping and conduit penetrations through the roof shall be provided with Pate Type PCA pipe curb assemblies or acceptable equivalent. Coordinate installation details with the roofing system being used for the project.

1.21 CUTTING AND PATCHING

- A. All cutting and patching shall be done per Division 01 requirements. The Contractor shall furnish sketches showing the location and sizes of all openings, chases, etc., required for the installation of work.
- B. Work under this Division shall include furnishing, locating, and setting inserts and/or sleeves required before the floors and walls are built or be responsible for cutting, drilling, or chopping where sleeves and inserts were not installed or correctly located. The Contractor shall do all drilling required for the installation of hangers.
- C. Exercise extreme caution when core drilling or punching openings in concrete floor slabs to avoid cutting or damaging structural members. No structural members or structural slabs/floors shall be cut without the written acceptance of a Structural Engineer and all such cutting shall be done in a manner directed by him.

1.22 SCAFFOLDING, RIGGING, AND HOISTING

- A. The Contractor shall furnish all scaffolding, rigging, hoisting, and services necessary for erection and delivery into the premises any equipment and apparatus furnished under this Division. Remove same from premises when no longer required.

1.23 WATERPROOFING

- A. Where any work pierces waterproofing, including waterproof concrete and floors in wet areas, the method of installation shall be reviewed by the Engineer before work is done. The

Contractor shall furnish all necessary sleeves, caulking, and flashing required to make openings watertight.

1.24 ACCESSIBILITY AND ACCESS PANELS

- A. The Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate thickness of partitions, and the adequate clearance in double partitions and hung ceilings for the proper installation of the work.
- B. Locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment shall include, but not be limited to motors, controllers, coil, valves, switchgear, drain points, etc. Access doors shall be furnished if required for better accessibility. Minor deviations from the Drawings may be made to allow better accessibility, but changes of magnitude or which involve extra cost shall not be made without the acceptance of the Engineer.
- C. Access doors in walls, ceilings, floors, etc., shall be field coordinated. It is the responsibility of the Contractor to coordinate and provide information regarding the sizes and quantities of access doors required for his work. The Contractor shall arrange his work in such a manner as to minimize the quantity of access doors required, such as grouping shutoff valves in the same area. Where possible, locate valves in already accessible areas, such as lay-in ceilings, etc.
- D. On a clean set of prints, the Contractor shall mark in red pencil the location of each required access door, including its size and fire rating (if any), and shall submit the print to the Architect for review before access doors are purchased or installed.
- E. Upon completion of the Project, the Contractor shall physically demonstrate that all equipment and devices installed have been located and/or provided with adequate access panels for repair, maintenance, and/or operation. Any equipment not so furnished shall be relocated or provided with additional access panels by the installing Contractor at no additional cost to the Owner.
- F. Permanent ladders for access to equipment when shown on Plans shall be furnished and installed. Coordinate exact requirements in field.

1.25 TEMPORARY OPENINGS

- A. The Contractor shall ascertain from an examination of the Drawings whether any special temporary openings in the building will be required for the admission of apparatus provided under this Division and shall coordinate the requirements accordingly. In the event of failure of the Contractor to give sufficient notice in time to arrange for these openings during construction, the Contractor shall assume all costs of providing such openings thereafter.

1.26 SHUTDOWNS

- A. When installation of a new system requires the temporary shutdown of an existing operating system, the connection of the new system shall be performed at such time as designated by the Owner's representative.
- B. The Engineer and the Owner shall be notified of the estimated duration of the shutdown period at least ten (10) days in advance of the date the work is to be performed.

- C. Work shall be arranged for continuous performance whenever possible. The Contractor shall provide all necessary labor, including overtime if required, to assure that existing operating services will be shut down only during the time required to make necessary connections.

1.27 TAGS AND CHARTS

- A. Refer to Section 220553 “Identification for Plumbing Piping and Equipment. Each valve and piece of apparatus under this Division shall be provided with suitable brass or laminated plastic tags and ceiling tag securely fastened with brass chains, screws, or rivets. Equipment shall be numbered with laminated plastic tags or neatly stenciled letters 2 inches high using designations in equipment schedules and/or shall conform to a directory indicating number, location and use of each item. Directories shall be prepared under each Section and shall be glass framed.
 - 1. Directory shall indicate valve tag number and the unit number, floor/area branch line, main line, service, or other pertinent data to quickly and easily identify the valve’s purpose.

1.28 ESCUTCHEONS

- A. The Contractor shall provide escutcheons on pipes wherever they pass through floors, ceilings, walls, or partitions in finished visible locations. See Section 220518 “Escutcheons for Plumbing Piping” for further requirements.

1.29 PAINTING

- A. All finish painting in completed areas shall be performed per Division 09 of the Specifications.
- B. All materials shipped to the job site under this Division, such as grilles, registers, and/or radiation covers, shall have standard manufacturer's finish, unless otherwise specified.
- C. The Contractor shall paint the interior of all ducts wherever the interior of the duct can be seen through a register or louver. Paint shall be flat black, rust preventative type.
- D. The Contractor shall paint conduits, pipe, and equipment wherever it can be seen through a register or louver. Paint shall not cover-up labels and other identifying items. Paint shall be flat black, rust preventative type.
- E. All uninsulated outdoor piping and fittings shall be properly primed with zinc-rich primer and finished with a minimum of two (2) coats of high-grade exterior enamel.

1.30 PIPE EXPANSION

- A. All pipe connections shall be installed to allow for freedom of movement of the piping during expansion and contraction without springing. Provide engineered design, layout, details, and fabrication, submitted with registered professional engineer sign and seal, of swing joints, expansion loops, and expansion joints with proper anchors and guides. Pay particular attention to plastic piping with high coefficients of expansion.
 - 1. Consideration of required seismic lateral restraints shall be given when anchoring piping and making provision for expansion.

1.31 ELECTRICAL CONNECTIONS

- A. Unless otherwise specified, all wiring shall be furnished and installed per Division 26 Specifications.
- B. The Contractor furnishing equipment shall furnish the motor controller required for the equipment. Provide properly sized overload heaters and all required accessories with all motor controllers.
- C. All power wiring shall be furnished and installed per Division 26 complete from power source to motor or equipment junction box including power wiring through the motor controller and proper means of disconnect per NEC and Division 26. The Division 26 Contractor shall provide all disconnects, unless noted otherwise.

1.32 QUIET OPERATION

- A. Equipment and material used in the various systems described herein shall not produce a sound level greater than 55 decibels in the area served. If noise level is deemed objectionable by the Owner/Engineer, the Contractor shall test and record sound levels in the presence of the Owner/Engineer. The sound level shall be observed on the "A" weighting network of a sound level or sound survey meter. The ASHRAE "Guide and Data Book" provides a means to determine sound level of mechanical equipment when the total of background plus equipment sound levels exceeds the minimum acceptable equipment sound level.
- B. If objectionable noises or vibrations of any magnitude are produced and transmitted to occupied portions of the building by apparatus, piping, ducts, or other parts of the mechanical work, the Contractor shall make such changes or additions as necessary without extra cost to the Owner.

1.33 MAINTENANCE

- A. The Contractor shall provide the necessary skilled labor to assure the proper operation and to provide all required current and preventative maintenance for all equipment and controls provided under this Division until final acceptance of the building by the Owner. The Contractor shall not assume acceptance of the building by the Owner until he receives written notification.
- B. The Contractor shall receive calls for any and all problems experienced in the operation of the equipment provided under this Division and he shall take steps to immediately correct any deficiencies that may exist.
- C. The Contractor shall provide a check list and shall put a copy of it in the boiler or main mechanical room. The check list shall itemize each piece of equipment furnished under his Section.
 - 1. The Contractor shall certify on this check list that he has examined each piece of equipment and that, in his opinion, it is operating as intended by the manufacturer, it has been properly lubricated, and that all necessary current and preventative maintenance has been performed as recommended by the manufacturer and by good and accepted practice.

- D. Where normal preventative maintenance for any piece of equipment requires special tools, the Contractor shall furnish the appropriate tools for that piece of equipment (i.e., special filter removal hooks, valve wrenches, etc.).

1.34 LUBRICATION

- A. All equipment installed under this Contract having moving parts and requiring lubrication shall be properly lubricated according to manufacturer's recommendations prior to testing and operation. Any such equipment discovered to have been operated before lubrication by the Contractor is subject to rejection and replacement at no additional cost to the Owner. Units furnished with sealed bearings are exempted.
- B. The Contractor shall furnish and install, as appropriate on all equipment requiring lubrication, Zerk pressure gun grease fittings or sight gravity-feed oilers equipped with shutoff and needle valve adjustment. Units furnished with sealed bearings and lifetime lubrication are exempted. All fittings and oilers are to be fully accessible for lubrication with equipment which does not require special adapters. Where fittings would be otherwise inaccessible, furnish and install extended grease lines.

1.35 CLEANING

- A. The Contractor shall be responsible for keeping the jobsite clean, safe, and neat throughout the duration of construction. The Contractor shall clean up his own debris daily and shall coordinate removal of rubbish and debris with the General Contractor/Construction Manager.
 - 1. No debris, construction materials, cigarette butts, coffee cups, etc., shall be left above suspended ceilings.
- B. The Contractor shall thoroughly clean and flush all piping and equipment of all foreign substances, oils, burrs, solder, flux, etc., inside and out before being placed in operation.
- C. If any part of a system should be stopped or damaged by any foreign matter after being placed in operation, the system shall be disconnected, cleaned, and reconnected wherever necessary to locate and/or remove obstructions. Any work damaged while removing obstructions shall be repaired or replaced when the system is reconnected at no additional cost to the Owner.
- D. During construction, all ducts and pipes shall be capped in an acceptable manner to insure adequate protection against the entrance of foreign matter.
- E. Upon completion of all work under the Contract, the Contractor shall remove from the premises all rubbish, debris, and excess materials left over from his work. Any oil or grease stains on floor areas caused by the Contractor shall be removed and floor areas left clean.

1.36 OPERATING INSTRUCTIONS

- A. Upon completion of all work and tests, the Contractor shall furnish the necessary skilled labor and helpers for operating his system and equipment for a period specified under each applicable Section of this Division. During this period, he shall fully instruct the Owner or the Owner's representative in the operation, adjustment, and maintenance of all equipment furnished. The Contractor shall give at least 72 hours' notice to the Owner and the Engineer in advance of this period.

- B. The Contractor shall formally submit for delivery to the Engineer three (3) complete bound sets of typewritten or blueprinted instructions for operating and maintaining all systems and equipment included in this Division. All instructions shall be submitted in draft for review prior to final issue. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instruction. Refer to Section 017823 "Operation and Maintenance Data".
- C. The Contractor, in the above-mentioned instructions, shall include the maintenance schedule for the principal items of equipment furnished under this Division.
- D. The appropriate Contractor shall physically demonstrate procedures for all routine maintenance of all equipment furnished under each respective Section to assure accessibility to all devices.
- E. An authorized manufacturer's representative shall attest in writing that the equipment has been professionally installed prior to startup of any major equipment. The following equipment will require this inspection: pumps; air conditioning equipment, controls, air handling equipment, boilers. These letters will be bound into the operating and maintenance books.
- F. Refer to individual trade Sections for any other requirements related to operating instructions.

1.37 ADJUSTING AND TESTING

- A. After all the equipment and accessories to be furnished are in place, they shall be put in final adjustment and subjected to such operating tests to assure the Engineer that they are in proper adjustment and in satisfactory, permanent operating condition.
- B. Where requested by the Engineer, a factory-trained service engineering representative shall inspect the installation and assist in the initial startup and adjustment to the equipment. The period of these services shall be for such time as necessary to secure proper installation and adjustments. After the equipment is placed in permanent operation, the service engineering representative shall supervise the initial operation of the equipment and instruct the personnel responsible for operation and maintenance of the equipment. The service engineering representative shall notify the Contractor in writing that the equipment was installed according to manufacturer's recommendations and is operating as intended by the manufacturer. Refer to Section 017900 "Demonstration and Training".

1.38 GUARANTEES

- A. The Contractor shall guarantee all equipment, material and workmanship under these Specifications and the Contract for a period of one (1) year from the date of final acceptance by Owner, unless otherwise noted.
- B. During this guarantee period, all defects developing through faulty equipment, materials, or workmanship shall be corrected or replaced immediately by the Contractor without expense to the Owner. Such repairs or replacements shall be made to the Engineer's satisfaction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 220100

SECTION 220518 - ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Escutcheons.
- 2. Floor plates.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated, and rough-brass finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.
- D. Split-Casting Brass Type: With polished, chrome-plated, and rough-brass finish and with concealed hinge and setscrew.
- E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.
- B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of 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 type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
 - i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
 - j. Bare Piping in Equipment Rooms: One-piece, cast-brass type with rough-brass finish.
 - k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.
 - 2. Escutcheons for Existing Piping:
 - a. Chrome-Plated Piping: Split-casting brass type with polished, chrome-plated finish.
 - b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge.
 - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge.
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
 - f. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge.
 - g. Bare Piping in Unfinished Service Spaces: Split-casting brass type with rough-brass finish.
 - h. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed hinge.
 - i. Bare Piping in Equipment Rooms: Split-casting brass type with rough-brass finish.
 - j. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with concealed hinge.

- 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 type.
 - 2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 220518

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Fiberglass pipe hangers.
 - 4. Metal framing systems.
 - 5. Fiberglass strut systems.
 - 6. Thermal-hanger shield inserts.
 - 7. Fastener systems.
 - 8. Pipe stands.
 - 9. Pipe positioning systems.
 - 10. Equipment supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 - 3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following: include Product Data for components:
 - 1. Trapeze pipe hangers.
 - 2. Metal framing systems.
 - 3. Fiberglass strut systems.
 - 4. Pipe stands.
 - 5. Equipment supports.

- C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Detail fabrication and assembly of trapeze hangers.
 - 2. Design Calculations: Calculate requirements for designing trapeze hangers.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.7 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pre-galvanized or hot dipped.
 - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless-steel.

- B. Stainless-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless-steel.

- C. Copper Pipe Hangers:

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

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 stainless-steel.

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 FIBERGLASS PIPE HANGERS

A. Clevis-Type, Fiberglass Pipe Hangers:

1. Description: Similar to MSS SP-58, Type 1, steel pipe hanger except hanger is made of fiberglass or fiberglass-reinforced resin.
2. Hanger Rods: Continuous-thread rod, washer, and nuts made of stainless-steel.

B. Strap-Type, Fiberglass Pipe Hangers:

1. Description: Similar to MSS SP-58, Type 9 or Type 10, steel pipe hanger except hanger is made of fiberglass-reinforced resin.
2. Hanger Rod and Fittings: Continuous-thread rod, washer, and nuts made of stainless-steel.

2.4 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Allied Tube & Conduit
 - b. Cooper B-Line, Inc.
 - c. Flex-Strut Inc.
 - d. Thomas & Betts Corporation
 - e. Unistrut Corporation; Tyco International, Ltd.
 - f. Wesanco, Inc.
2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless-steel.
7. Metallic Coating: Hot-dipped galvanized.
8. Paint Coating: Epoxy.
9. Plastic Coating: PVC.

2.5 THERMAL-HANGER SHIELD INSERTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1. Carpenter & Paterson, Inc.
 - 2. Clement Support Services
 - 3. ERICO International Corporation
 - 4. National Pipe Hanger Corporation
 - 5. PHS Industries, Inc.
 - 6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
 - 7. Piping Technology & Products, Inc.
 - 8. Rilco Manufacturing Co., Inc.
 - 9. Value Engineered Products, Inc.
- B. Insulation-Insert Material for Cold Piping: ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.
- C. Insulation-Insert Material for Hot Piping: ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.
- D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

- A. Mechanical-Expansion Anchors: Insert-wedge-type, stainless-steel anchors, for use in hardened Portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.7 PIPE STANDS

- A. General Requirements for Pipe Stands: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
- C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.
- D. High-Type, Single-Pipe Stand:
 - 1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
 - 2. Base: Stainless-steel.

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3. Vertical Members: Two (2) or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand:

1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
2. Bases: One (1) or more; plastic.
3. Vertical Members: Two (2) or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.8 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.9 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.10 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink, and nonmetallic grout; suitable for interior and exterior applications.
1. Properties: Non-staining, noncorrosive, and nongaseous.
 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 2. Field fabricate from ASTM A 36, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Fiberglass Pipe-Hanger Installation: Comply with applicable portions of MSS SP-69 and MSS SP-89. Install hangers and attachments as required to properly support piping from building structure.
- D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- E. Fiberglass Strut System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled fiberglass struts.
- F. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- G. Fastener System Installation:
1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- H. Pipe Stand Installation:
1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
 2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb.
- I. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- J. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- K. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- L. 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.
- M. Install lateral bracing with pipe hangers and supports to prevent swaying.
- N. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- O. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

P. 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.

Q. Insulated Piping:

1. Attach clamps and spacers to piping.
 - a. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating Below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048-inch-thick.
 - b. NPS 4: 12 inches long and 0.06-inch-thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06-inch-thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075-inch-thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105-inch-thick.
5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

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- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1½ inches.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports metal trapeze pipe hangers and metal framing systems and attachments for general service applications.
- F. Use stainless-steel pipe hangers and fiberglass pipe hangers and fiberglass strut systems and stainless-steel or corrosion-resistant attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and stainless-steel attachments for copper piping and tubing.

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- H. Use padded hangers for piping that is subject to scratching.
- I. Use thermal-hanger shield inserts for insulated piping and tubing.
- J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 - 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
 - 5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
 - 6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of non-insulated, stationary pipes NPS 3/4 to NPS 8.
 - 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8.
 - 8. Adjustable Band Hangers (MSS Type 9): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8.
 - 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8.
 - 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of non-insulated, stationary pipes NPS 3/8 to NPS 8.
 - 11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of non-insulated, stationary pipes NPS 3/8 to NPS 3.
 - 12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 - 13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 - 14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 - 15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 - 16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
 - 17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two (2) rods if longitudinal movement caused by expansion and contraction might occur.
 - 18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
 - 19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
 - 20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.

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21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. 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.

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13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1¼ inches.
 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to twenty-five percent (25%) to allow expansion and contraction of piping system from hanger.
 6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to twenty-five percent (25%) to allow expansion and contraction of piping system from base support.
 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to twenty-five percent (25%) to allow expansion and contraction of piping system from trapeze support.
 8. Constant Supports: For critical piping stress and if necessary, to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
 - a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two (2) vertical-type supports and one (1) trapeze member.
- P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- Q. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- R. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

- S. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

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. Warning signs and labels.
 - 3. Pipe labels.
 - 4. Stencils.
 - 5. Valve tags.
 - 6. Warning tags.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
 - 1. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Letter Color: White.
 - 3. Background Color: Black.
 - 4. Minimum Label Size: Length and width vary for required label content, but not less than 2½-by-¾-inch.
 - 5. Minimum Letter Size: ¼-inch for name of units if viewing distance is less than 24 inches, ½-inch for viewing distances up to 72 inches, and proportionately larger lettering for

- greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
 - 6. Fasteners: Stainless-steel rivets.
 - 7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Plastic Labels for Equipment:
- 1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8-inch-thick, and having predrilled holes for attachment hardware.
 - 2. Letter Color: White.
 - 3. Background Color: Black.
 - 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
 - 5. Minimum Label Size: Length and width vary for required label content, but not less than 2½-by-¾-inch.
 - 6. Minimum Letter Size: ¼-inch for name of units if viewing distance is less than 24 inches, ½-inch for viewing distances up to 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.
 - 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.
- D. Equipment Label Schedule: For each item of equipment to be labeled, on 8½-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.
- 2.2 WARNING SIGNS AND LABELS
- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8-inch-thick, and having predrilled holes for attachment hardware.
 - B. Letter Color: Black.
 - C. Background Color: Yellow.
 - 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 2½-by-¾-inch.
 - F. Minimum Letter Size: ¼-inch for name of units if viewing distance is less than 24 inches, ½-inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
 - G. Fasteners: Stainless-steel rivets.

- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pre-tensioned Pipe Labels: Pre-coiled, semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; 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.

2.4 STENCILS

- A. Stencils for Piping:
 - 1. Lettering Size: Size letters according to ASME A13.1 for piping.
 - 2. Stencil Material: Fiberboard or metal.
 - 3. Stencil Paint: Exterior, gloss, acrylic enamel in colors complying with recommendations in ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.
 - 4. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.

2.5 VALVE TAGS

- A. Valve Tags: Stamped or engraved with ¼-inch letters for piping system abbreviation and ½-inch numbers.
 - 1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Fasteners: Brass wire-link chain or S-hook.
- B. Valve Schedules: For each piping system, on 8½-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
 - 1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

- A. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.
 - 1. Size: 3 by 5¼ inches minimum.
 - 2. Fasteners: Brass grommet and wire.
 - 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
 - 4. Color: Safety yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION 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.

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. Piping Color Coding: Painting of piping is specified in Section 099123 "Interior Painting."
- B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, with painted, color-coded bands or rectangles on each piping system.
 - 1. Identification Paint: Use for contrasting background.
 - 2. Stencil Paint: Use for pipe marking.
- C. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 5. Near major equipment items and other points of origination and termination.
 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- D. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.
- E. Pipe Label Color Schedule:
1. Low-Pressure Compressed Air Piping:
 - a. Background: Safety blue.
 - b. Letter Colors: White.
 2. High-Pressure Compressed Air Piping:
 - a. Background: Safety blue.
 - b. Letter Colors: White.
 3. Domestic Water Piping
 - a. Background: Safety green.
 - b. Letter Colors: White.
 4. Sanitary Waste and Storm Drainage Piping:
 - a. Background Color: Safety green.
 - b. Letter Color: 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, faucets, convenience and lawn-watering hose connections, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
1. Valve-Tag Size and Shape:
 - a. Cold Water: 2 inches, round.
 - b. Hot Water: 2 inches, round.
 2. Valve-Tag Colors:

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- a. Cold Water: Natural.
 - b. Hot Water: Natural.
3. Letter Colors:
- a. Cold Water: Black.
 - b. Hot Water: Black.

3.6 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 220553

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes insulating the following plumbing piping services:
 - 1. Domestic cold-water piping.
 - 2. Domestic hot-water piping.
 - 3. Domestic recirculating hot-water piping.
 - 4. Sanitary waste piping exposed to freezing conditions.
 - 5. Supplies and drains for handicap-accessible lavatories and sinks.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail 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.
- C. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:
 - 1. Preformed Pipe Insulation Materials: 12 inches long by NPS 2.
 - 2. Jacket Materials for Pipe: 12 inches long by NPS 2.
 - 3. Sheet Jacket Materials: 12 inches square.
 - 4. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.

- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- C. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Architect. Use materials indicated for the completed Work.
 - 1. Piping Mockups:
 - a. One (1) 10-foot section of NPS 2 straight pipe.
 - b. One (1) each of a 90-degree threaded, welded, and flanged elbow.
 - c. One (1) each of a threaded, welded, and flanged tee fitting.
 - d. One (1) NPS 2 or smaller valve, and one (1) NPS 2-1/2 or larger valve.
 - e. Four (4) support hangers including hanger shield and insert.
 - f. One (1) threaded strainer and one (1) flanged strainer with removable portion of insulation.
 - g. One (1) threaded reducer and one (1) welded reducer.
 - h. One (1) pressure temperature tap.
 - i. One (1) mechanical coupling.
 - 2. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.
 - 3. Notify Architect seven (7) days in advance of dates and times when mockups will be constructed.
 - 4. Obtain Architect's approval of mockups before starting insulation application.
 - 5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

7. Demolish and remove mockups when directed.

D. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

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. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless-steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless-steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

- F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Pittsburgh Corning Corporation; **Foamglas**
 2. Block Insulation: ASTM C 552, Type I.
 3. Special-Shaped Insulation: ASTM C 552, Type III.
 4. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
 5. Preformed Pipe Insulation with Factory-Applied ASJ-SSL: Comply with ASTM C 552, Type II, Class 2.
 6. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
- G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Aeroflex USA, Inc; **Aerocel**
 - b. Armacell LLC; **AP Armaflex**
 - c. K-Flex USA; **Insul-Lock, K-Fit Elbow, Tee, and P-Trap K-FLEX LS**
- H. Mineral-Fiber, Preformed Pipe Insulation:
1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Johns Manville; a Berkshire Hathaway company; **Micro-Lok**
 - b. Knauf Insulation; **Earthwool 1000 Degree Pipe Insulation with ECOSE Technology**
 - c. Owens Corning; **Fiberglas Pipe Insulation**
 2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-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. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Ramco Insulation, Inc; **Super-Stik**
- B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Ramco Insulation, Inc; **Thermokote V**

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Ramco Insulation, Inc; **Ramcote 1200** and **Quik-Cote**

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Foster Brand; H. B. Fuller Construction Products; **81-84**

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Childers Brand; H. B. Fuller Construction Products; **CP-127**

b. Eagle Bridges - Marathon Industries

c. Foster Brand; H. B. Fuller Construction Products; **85-60/85-70**

d. Mon-Eco Industries, Inc; **22-25**

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Childers Brand; H. B. Fuller Construction Products; **CP-82**

b. Eagle Bridges - Marathon Industries

c. Foster Brand; H. B. Fuller Construction Products; **85-20**

d. Mon-Eco Industries, Inc; **22-25**

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

- a. Foster Brand; H. B. Fuller Construction Products; **30-80/30-90**
- b. Knauf Insulation; **EXPERT Mastics - KI-900 ASJ**
- c. Vimasco Corporation

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.

3. Service Temperature Range: Minus 20 to plus 180 deg F.

4. Solids Content: ASTM D 1644, fifty-eight percent (58%) by volume and seventy percent (70%) by weight.

5. Color: White.

- C. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

- a. Childers Brand; H. B. Fuller Construction Products; **Encacel**
- b. Eagle Bridges - Marathon Industries
- c. Foster Brand; H. B. Fuller Construction Products; **60-95/60-96**

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.

3. Service Temperature Range: Minus 50 to plus 220 deg F.

4. Solids Content: ASTM D 1644, thirty-three percent (33%) by volume and forty-six percent (46%) by weight.

5. Color: White.

- D. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

- a. Childers Brand; H. B. Fuller Construction Products; **CP-10**
- b. Eagle Bridges - Marathon Industries
- c. Foster Brand; H. B. Fuller Construction Products; **46-50**
- d. Knauf Insulation; **EXPERT Mastics - KI-705 ASJ+**

- e. Mon-Eco Industries, Inc; **55-50**
 - f. Vimasco Corporation; **WC-1/WC-5**
2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: Sixty percent (60%) by volume and sixty-six percent (66%) by weight.
 5. 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. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Childers Brand; H. B. Fuller Construction Products; **CP-50 AHV2**
 - b. Foster Brand; H. B. Fuller Construction Products; **30-36**
 - c. Vimasco Corporation; **713** and **714**
 3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
 4. Service Temperature Range: 0 to plus 180 deg F.
 5. Color: White.

2.6 SEALANTS

- A. Joint Sealants:
1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Childers Brand; H. B. Fuller Construction Products; **CP-76**
 - b. Eagle Bridges - Marathon Industries
 - c. Foster Brand; H. B. Fuller Construction Products; **30-45**
 - d. Mon-Eco Industries, Inc; **44-05**
 - e. Pittsburgh Corning Corporation; **Pittseal 444**
 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 3. Permanently flexible, elastomeric sealant.
 4. Service Temperature Range: Minus 100 to plus 300 deg F.
 5. Color: White or gray.
 6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. FSK and Metal Jacket Flashing Sealants:
1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

- a. Childers Brand; H. B. Fuller Construction Products; **CP-76**
 - b. Eagle Bridges - Marathon Industries
 - c. Foster Brand; H. B. Fuller Construction Products; **95-44**
 - d. Mon-Eco Industries, Inc; **44-05**
2. Materials shall be compatible with insulation materials, jackets, and substrates.
 3. Fire- and water-resistant, flexible, elastomeric sealant.
 4. Service Temperature Range: Minus 40 to plus 250 deg F.
 5. Color: Aluminum.
 6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Childers Brand; H. B. Fuller Construction Products; **CP-76**
 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 3. Fire- and water-resistant, flexible, elastomeric sealant.
 4. Service Temperature Range: Minus 40 to plus 250 deg F.
 5. Color: White.
 6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7 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: White, Kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with Kraft-paper backing; complying with ASTM C 1136, Type II.

2.8 TAPES

- A. ASJ Tape: White 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 (1) of the following:
 - a. Avery Dennison Corporation, Specialty Tapes Division; **Fasson 0836**
 - b. Compac Corporation; **104 and 105**
 - c. Ideal Tape Co., Inc.; an American Biltrite company; **428 AWF ASJ**
 - d. Knauf Insulation; EXPERT Tapes - **ASJ+ Tape**
 - e. Venture Tape; **1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ**

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: Two percent (2%).
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

2.9 SECUREMENTS

A. Bands:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. ITW Insulation Systems; Illinois Tool Works, Inc; **Gerrard Strapping and Seals**
 - b. RPR Products, Inc; **Insul-Mate Strapping and Seals**
2. Stainless-Steel: ASTM A 167 or ASTM A 240, Type 316; 0.015-inch-thick, ¾-inch-wide with wing seal or closed seal.
3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020-inch-thick, ¾-inch-wide with wing seal or closed seal.

B. Staples: Outward-clinching insulation staples, nominal ¾-inch-wide, stainless-steel or Monel.

C. Wire: 0.062-inch soft-annealed, stainless-steel.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. C & F Wire

2.10 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. McGuire Manufacturing
 - b. Truebro
 - c. Zurn Industries, LLC
2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

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 prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 - 1. Stainless-Steel: Coat 300 series stainless-steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
 - 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.

- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. 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 1½ 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 seventy-five percent (75%) 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. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- C. Insulation Installation at Floor Penetrations:
 1. Pipe: Install insulation continuously through floor penetrations.
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two (2) times the thickness of pipe insulation, or one (1) 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 (2) times the thickness of pipe insulation, or one (1) 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 (2) times the thickness of pipe insulation, or one (1) 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 (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 (2) halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.

3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.

2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1-inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.9 INSTALLATION OF PHENOLIC INSULATION

A. General Installation Requirements:

1. Secure single-layer insulation with stainless-steel bands at 12-inch intervals and tighten bands without deforming insulation materials.
2. Install 2-layer insulation with joints tightly butted and staggered at least 3 inches. Secure inner layer with 0.062-inch wire spaced at 12-inch intervals. Secure outer layer with stainless-steel bands at 12-inch intervals.

B. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

C. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of same material and thickness as pipe insulation.

D. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.

E. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.10 INSTALLATION OF POLYOLEFIN INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of polyolefin pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install cut sections of polyolefin pipe and sheet insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
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.

3.11 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 (2) 0.062-inch-thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1½-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.

- 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
 - 1. Apply two (2) continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.12 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below.
 - 1. Flat Acrylic Finish: Two (2) finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two (2) coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect and Owner from manufacturer's entire range. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.13 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to 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 (3) locations of straight pipe, three (3) locations of threaded fittings, three (3) locations of welded fittings, two (2) locations of threaded strainers, two (2) locations of welded strainers, three (3) locations of threaded valves, and three (3) locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.14 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Drainage piping located in crawl spaces.
 - 2. Underground piping.
 - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.15 PIPING INSULATION SCHEDULE

- A. Refer to Schedule on Drawings.

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. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

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. 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 no fewer than two (2) days in advance of proposed interruption of water service.
 - 2. Do not interrupt water service without Architect'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 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

- B. Soft Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L water tube, annealed temper.
- C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- F. 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.
- G. Copper Pressure-Seal-Joint Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the followings:
 - a. Apollo Valves
 - b. Elkhart Products Corporation
 - c. NIBCO Inc.
 - d. Viega
 - 2. Fittings for NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
 - 3. Fittings for NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
 - 4. Fittings: Bronze or copper shall conform to the material requirements of ASME B16.18 or ASME B16.22, and the performance requirements of IAPMO PS117, and ICC LC1002. Fittings shall have an EPDM sealing element and Smart Connect (SC) feature. 2½-inch thru 4-inch shall have a 420 stainless-steel grip ring, PBT separator ring, EPDM sealing element and Smart Connect (SC) feature. Fittings with EPDM sealing element shall conform to NSF 61-pw-G when installed in a potable water system.

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.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 ENCASEMENT FOR PIPING

- A. Standard: ASTM A 674 or AWWA C105/A21.5.
- B. Form: Sheet or tube.
- C. Color: Black or natural.

2.5 TRANSITION FITTINGS

A. General Requirements:

- 1. Same size as pipes to be joined.
- 2. Pressure rating at least equal to pipes to be joined.
- 3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the followings:
 - a. Cascade Waterworks Manufacturing
 - b. Dresser, Inc.; Dresser Piping Specialties
 - c. Hays Fluid Controls; a division of ROMAC Industries Inc.
 - d. JCM Industries
 - e. Smith-Blair, Inc.
 - f. Viking Johnson

D. Plastic-to-Metal Transition Fittings:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the followings:
 - a. Charlotte Pipe and Foundry Company
 - b. Harvel Plastics, Inc.
 - c. Spears Manufacturing Company
- 2. Description:
 - a. CPVC or PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.
 - b. One (1) end with threaded brass insert and one (1) solvent-cement-socket or threaded end.

E. Plastic-to-Metal Transition Unions:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the followings:

- a. Colonial Engineering, Inc.
 - b. NIBCO Inc.
 - c. Spears Manufacturing Company
2. Description:
- a. CPVC or PVC four-part union.
 - b. Brass or stainless-steel threaded end.
 - c. Solvent-cement-joint or threaded plastic end.
 - d. Rubber O-ring.
 - e. Union nut.

2.6 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Capitol Manufacturing Company; member of the Phoenix Forge Group
 - b. Central Plastics Company
 - c. Hart Industries International, Inc.
 - d. Jomar International
 - e. Matco-Norca
 - f. McDonald, A. Y. Mfg. Co.
 - g. Watts; a division of Watts Water Technologies, Inc.
 - h. Wilkins; a Zurn company
 2. Standard: ASSE 1079.
 3. Pressure Rating: 125 psig minimum at 180 deg F.
 4. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Capitol Manufacturing Company; member of the Phoenix Forge Group
 - b. Central Plastics Company
 - c. Matco-Norca
 - d. Watts; a division of Watts Water Technologies, Inc.
 - e. Wilkins; a Zurn company
 2. Standard: ASSE 1079.
 3. Factory-fabricated, bolted, companion-flange assembly.
 4. Pressure Rating: 125 psig minimum at 180 deg F.
 5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Central Plastics Company
 - d. Pipeline Seal and Insulator, Inc.
2. Nonconducting materials for field assembly of companion flanges.
3. Pressure Rating: 150 psig.
4. Gasket: Neoprene or phenolic.
5. Bolt Sleeves: Phenolic or polyethylene.
6. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Elster Perfection Corporation
 - b. Grinnell Mechanical Products; Tyco Fire Products LP
 - c. Matco-Norca
 - d. Precision Plumbing Products, Inc.
 - e. Victaulic Company
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 underground copper tube in PE encasement according to ASTM A 674 or AWWA C105/A21.5.
- D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance.

- E. Install shutoff valve immediately upstream of each dielectric fitting.
- F. Install domestic water piping level without pitch and plumb.
- G. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- H. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- I. 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.
- J. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- K. Install piping to permit valve servicing.
- L. 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.
- M. Install piping free of sags and bends.
- N. Install fittings for changes in direction and branch connections.
- O. Install PEX piping with loop at each change of direction of more than 90 degrees.
- P. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.2 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

- E. 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."
- F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.
- G. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- H. Joints for PEX Piping: Join according to ASTM F 1807.
- I. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.3 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
 - 1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
 - 2. Fittings for NPS 2 and Larger: Sleeve-type coupling.
- C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.4 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.
- C. Dielectric Fittings for NPS 2-1/2 to and Larger: Use dielectric flange kits.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
 - 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. Support vertical piping and tubing at base and at each floor.

- C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8-inch.
- D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 - 4. NPS 2-1/2: 108 inches with 1/2-inch rod.
 - 5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
 - 6. NPS 6: 10 feet with 5/8-inch rod.
 - 7. NPS 8: 10 feet with 3/4-inch rod.
- E. Install supports for vertical copper tubing every 10 feet.
- F. Install vinyl-coated hangers for PEX piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1 and Smaller: 32 inches with 3/8-inch rod.
- G. Install hangers for vertical PEX piping every 48 inches.
- H. Install vinyl-coated hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 2 and Smaller: 48 inches with 3/8-inch rod.
 - 2. NPS 2-1/2 to NPS 3-1/2: 48 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
 - 4. NPS 6: 48 inches with 3/4-inch rod.
 - 5. NPS 8: 48 inches with 7/8-inch rod.
- I. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 - 1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 - 2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.

3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.7 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."
- B. Label pressure piping with system operating pressure.

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 (1) 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 4 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 ADJUSTING

- A. Perform the following adjustments before operation:
 - 1. Close drain valves, hydrants, and hose bibbs.
 - 2. Open shutoff valves to fully open position.
 - 3. Open throttling valves to proper setting.
 - 4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
 - 5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
 - 6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
 - 7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
 - 8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.10 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
 - 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 - 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for 3 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. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.11 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Refer to Piping Schedules on Drawings.

3.12 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller. Use ball or gate valves with flanged ends for piping NPS 2-1/2 and larger.
 - 2. Throttling Duty: Use ball valves for piping NPS 2 and smaller. Use ball valves with flanged ends for piping NPS 2-1/2 and larger.
 - 3. Hot-Water Circulation Piping, Balancing Duty: Calibrated balancing valves.
 - 4. Drain Duty: Hose-end drain valves.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

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. Vacuum breakers.
2. Balancing valves.
3. Temperature-actuated, water mixing valves.
4. Strainers.
5. Outlet boxes.
6. Hose bibbs.
7. Wall hydrants.
8. Drain valves.
9. Water-hammer arresters.
10. Trap-seal primer valves.
11. Trap-seal primer systems.
12. Specialty valves.
13. 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. Potable-water piping, and components shall comply with NSF 61 Annex G and NSF 14. Mark "NSF-pw" on plastic piping components.

2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Ames Co.
 - b. Ames Fire & Waterworks
 - c. Apollo Valves; Conbraco Industries, Inc.
 - d. Cash Acme
 - e. FEBCO
 - f. Watts; a Watts Water Technologies company
 - g. Zurn Industries, LLC
- 2. Standard: ASSE 1001.
- 3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
- 4. Body: Bronze.
- 5. Inlet and Outlet Connections: Threaded.
- 6. Finish: Chrome plated.

- B. Hose-Connection Vacuum Breakers:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Apollo Valves; Conbraco Industries, Inc.
 - b. Arrowhead Brass Products
 - c. Cash Acme
 - d. Legend Valve & Fitting, Inc.
 - e. MIFAB, Inc.
 - f. Prier Products, Inc.
 - g. Watts; a Watts Water Technologies company
 - h. Woodford Manufacturing Company
 - i. Zurn Industries, LLC
- 2. Standard: ASSE 1011.
- 3. Body: Bronze, nonremovable, with manual drain.
- 4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.

5. Finish: Rough bronze.

C. Pressure Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

- a. Ames Co.
- b. Ames Fire & Waterworks
- c. Apollo Valves; Conbraco Industries, Inc.
- d. FEBCO
- e. Flomatic Corporation
- f. Toro Company (The)
- g. Watts; a Watts Water Technologies company
- h. Zurn Industries, LLC

2. Standard: ASSE 1020.

3. Operation: Continuous-pressure applications.

4. Pressure Loss: 5 psig maximum, through middle third of flow range.

5. Accessories:

- a. Valves: Ball type, on inlet and outlet.

D. Spill-Resistant Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

- a. Apollo Valves; Conbraco Industries, Inc.
- b. Watts; a Watts Water Technologies company
- c. Zurn Industries, LLC

2. Standard: ASSE 1056.

3. Operation: Continuous-pressure applications.

4. Accessories:

- a. Valves: Ball type, on inlet and outlet.

2.4 BACKFLOW PREVENTERS

A. Hose-Connection Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

- a. Apollo Valves; Conbraco Industries, Inc.
- b. Watts; a Watts Water Technologies company
- c. Woodford Manufacturing Company

2. Standard: ASSE 1052.

3. Operation: Up to 10-foot head of water back pressure.

4. Inlet Size: NPS 1/2 or NPS 3/4.
5. Outlet Size: Garden-hose thread complying with ASME B1.20.7.
6. Capacity: At least 3-gpm flow.

B. Backflow-Preventer Test Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Apollo Valves; Conbraco Industries, Inc.
 - b. FEBCO
 - c. Flomatic Corporation
 - d. Watts; a Watts Water Technologies company
 - e. Zurn Industries, LLC
2. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.5 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Armstrong International, Inc.
 - b. Flo Fab Inc.
 - c. ITT Corporation
 - d. NIBCO INC.
 - e. Schneider Electric USA, Inc.
 - f. TACO Incorporated
 - g. Watts; a Watts Water Technologies company
2. Type: Ball or Y-pattern globe valve with two (2) readout ports and memory-setting indicator.
3. Body: brass or bronze.
4. Size: Same as connected piping, but not larger than NPS 2.
5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

2.6 SELF ACTUATING THERMOSTATIC BALANCING VALVE (SATBV)

- A. Basis-of-Design: Furnish and install **Circuit Solver** as indicated on the Drawings. **Circuit Solver** shall be self-contained and fully automatic without additional piping or control mechanisms. Valve shall be **Circuit Solver** as manufactured by ThermOmegaTech, Inc., or equivalent by approved manufacturer.
1. SATBV device shall regulate the flow of recirculated domestic hot water based on water temperature entering the SATBV regardless of system operating pressure.
 - a. Even when fully closed the SATBV shall bypass a small amount hot water to maintain dynamic control of the recirculating loop.

- b. SATBV shall be factory adjustable as required by project conditions.
 - c. SATBV shall be available in sizes ranging from ½” NPT to 2” NPT.
2. SATBV device’s body and all internal components shall be constructed of stainless-steel with major components constructed of type 303 stainless-steel.
- a. SATBV sizes ½-inch through 2-inch shall be rated to 200 psig maximum working pressure.
 - 1) All SATBV shall be standard tapered female pipe thread, NPT.
 - b. All SATBV shall be rated to 300°F (148.9°C) maximum working temperature.
 - c. All SATBV shall be NSF-61 certified for use in all domestic water systems.
 - d. Thermal actuator shall be spring loaded and self-cleaning, delivering closing thrust sufficient to keep orifice opening free of scale deposits.
3. Installation of **Circuit Solver** shall be made by qualified tradesmen. Install SATBV in each domestic hot water return piping branch beyond last hot water device in that branch.
- a. Provide suitable line size isolation valves, unions, and strainer as indicated in piping detail shown on the Drawings.
 - b. Provide suitable access panel as required in non-accessible ceilings and walls.

2.7 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Apollo Valves; Conbraco Industries, Inc.
 - b. Armstrong International, Inc.
 - c. Cash Acme
 - d. Honeywell Home Water Controls
 - e. Legend Valve & Fitting, Inc.
 - f. Leonard Valve Company
 - g. Powers
 - h. Symmons Industries, Inc.
 - i. TACO Incorporated
 - j. Watts; a Watts Water Technologies company
 - k. Zurn Industries, LLC
- 2. Standard: ASSE 1070.
- 3. Pressure Rating: 125 psig.
- 4. Type: Thermostatically controlled, water mixing valve.
- 5. Material: Bronze body with corrosion-resistant interior components.
- 6. Connections: Threaded union inlets and outlet.
- 7. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
- 8. Refer to Schedules on Drawings for additional criteria.

B. Primary, Thermostatic, Water Mixing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Acorn Engineering Company
 - b. Apollo Valves; Conbraco Industries, Inc.
 - c. Armstrong International, Inc.
 - d. Honeywell Home Water Controls
 - e. Lawler Manufacturing Company, Inc.
 - f. Leonard Valve Company
 - g. Powers
 - h. Symmons Industries, Inc.
 - i. Zurn Industries, LLC
2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Refer to Schedules on Drawings for additional criteria.

2.8 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless-steel with round perforations unless otherwise indicated.
5. Drain: Factory-installed, hose-end drain valve.

2.9 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral or field-installation, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Chrome or nickel plated.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Wheel handle.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.10 WALL HYDRANTS

A. Moderate-Climate Wall Hydrants:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Jay R. Smith Mfg. Co.
 - b. Josam Company
 - c. Watts; a Watts Water Technologies company
 - d. Woodford Manufacturing Company
 - e. Zurn Industries, LLC
2. Standard: ASME A112.21.3M for exposed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Inlet: NPS 3/4 or NPS 1.
6. Outlet:
 - a. Concealed, with integral vacuum breaker or nonremovable hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
 - b. Garden-hose thread complying with ASME B1.20.7.
7. Box: Deep, flush mounted with cover.
8. Box and Cover Finish: Chrome plated.
9. Outlet:
 - a. Concealed, with integral vacuum breaker or nonremovable hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
 - b. Garden-hose thread complying with ASME B1.20.7.
10. Nozzle and Wall-Plate Finish: Rough bronze.
11. Operating Key(s): Two (2) with each wall hydrant.

B. Vacuum Breaker Wall Hydrants:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. A.Y. McDonald Mfg. Co.
 - b. Arrowhead Brass Products
 - c. Jay R. Smith Mfg. Co.
 - d. Mansfield Plumbing Products LLC
 - e. Prier Products, Inc.
 - f. Watts; a Watts Water Technologies company
 - g. Woodford Manufacturing Company
 - h. Zurn Industries, LLC
2. Standard: ASSE 1019, Type A or Type B.

3. Type: Freeze-resistant, automatic draining with integral air-inlet valve.
4. Classification: Type A, for automatic draining with hose removed or Type B, for automatic draining with hose removed or with hose attached and nozzle closed.
5. Pressure Rating: 125 psig.
6. Operation: Loose key.
7. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
8. Inlet: NPS 1/2 or NPS 3/4.
9. Outlet: Exposed with garden-hose thread complying with ASME B1.20.7.

2.11 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

B. Gate-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-80 for gate valves.
2. Pressure Rating: Class 125.
3. Size: NPS 3/4.
4. Body: ASTM B 62 bronze.
5. Inlet: NPS 3/4 threaded or solder joint.
6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

C. Stop-and-Waste Drain Valves:

1. Standard: MSS SP-110 for ball valves or MSS SP-80 for gate valves.
2. Pressure Rating: 200-psig minimum CWP or Class 125.
3. Size: NPS 3/4.
4. Body: Copper alloy or ASTM B 62 bronze.
5. Drain: NPS 1/8 side outlet with cap.

2.12 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. AMTROL, Inc.
 - b. Jay R. Smith Mfg. Co.

- c. Josam Company
- d. MIFAB, Inc.
- e. Precision Plumbing Products
- f. Sioux Chief Manufacturing Company, Inc.
- g. Tyler Pipe; a subsidiary of McWane Inc.
- h. Watts; a Watts Water Technologies company
- i. Zurn Industries, LLC

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.13 TRAP SEAL PROTECTION DEVICES

A. Barrier Type Trap Seal Protection Devices:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Provent Systems Inc.
 - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - c. SureSeal Manufacturing
2. Standard: ASSE 1072-2007.
3. Body: ASB plastic.
4. Diaphragm and Sealing Gasket: Neoprene rubber.
5. Size: 2-inch, 3-inch, or 4-inch.
6. Gravity Drain Outlet Connection: Compression fit sealing gasket 80 durometer.

2.14 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Flex Pression Ltd.
2. Flex-Hose Co., Inc.
3. Flexicraft Industries
4. Flex-Weld, Inc.
5. Hyspan Precision Products, Inc.
6. Mercer Gasket & Shim, Inc.
7. Metraflex Company (The)
8. Proco Products, Inc.
9. Tozen Corporation
10. Unaflex
11. Universal Metal Hose

B. Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig.
2. End Connections NPS 2 and Smaller: Threaded copper pipe or plain-end copper tube.

3. End Connections NPS 2-1/2 and Larger: Flanged copper alloy.
- C. 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.
 3. End Connections NPS 2-1/2 and Larger: Flanged steel nipple.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 1. Locate backflow preventers in same room as connected equipment or system.
 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two (2) pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
 3. Do not install bypass piping around backflow preventers.
- B. Install balancing valves in locations where they can easily be adjusted.
- C. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
 1. Install cabinet-type units recessed in or surface mounted on wall as specified.
- D. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, solenoid valve, and pump.
- E. Set nonfreeze, nondraining-type post hydrants in concrete or pavement.
- F. Install water-hammer arresters in water piping according to PDI-WH 201.

3.2 CONNECTIONS

- A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Fire-retardant-treated-wood blocking is specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

3.3 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Balancing valves.
2. Thermostatic mixing valves.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test each vacuum breaker according to authorities having jurisdiction and the device's reference standard.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Set field-adjustable flow set points of balancing valves.

B. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION 221119

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipe, tube, and fittings.
 - 2. Specialty pipe fittings.
 - 3. Encasement for underground metal piping.

1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.
 - 2. Waste, Force-Main Piping: 50 psig.
- B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.
- B. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

- B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-DWV" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

1.7 PROJECT CONDITIONS

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify Architect no fewer than two (2) days in advance of proposed interruption of sanitary waste service.
 - 2. Do not proceed with interruption of sanitary waste service without Architect's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service and Extra Heavy class(es). Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute.
- B. Gaskets: ASTM C 564, rubber.
- C. Caulking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, ASTM A 888 or CISPI 301. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute.
- B. CISPI, Hubless-Piping Couplings:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide ANACO-Husky or comparable product by one (1) of the following:
 - a. Fernco Inc.
 - b. Mission Rubber Company, LLC; a division of MCP Industries
 - c. Tyler Pipe; a subsidiary of McWane Inc.
 - 2. Standards: ASTM C 1277 and CISPI 310 and shall be marked with the trademark of NSF International.
 - 3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- C. Heavy-Duty, Hubless-Piping Couplings:

1. Basis-of-Design Product: Subject to compliance with requirements, provide ANACO-Husky or comparable product by one (1) of the following:
 - a. Clamp-All Corp.
 - b. Mission Rubber Company, LLC; a division of MCP Industries
 - c. Tyler Pipe; a subsidiary of McWane Inc.
2. Standards: ASTM C 1277 and ASTM C 1540.
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- B. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.
- C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- D. Adhesive Primer: ASTM F 656.
 1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. Solvent Cement: ASTM D 2564.
 1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
 1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
 2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
 3. Unshielded, Non-Pressure Transition Couplings:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1) Fernco Inc.
 - 2) Froet Industries LLC
 - 3) Mission Rubber Company, LLC; a division of MCP Industries
 - b. Standard: ASTM C 1173.
 - c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

- d. Sleeve Materials:
 - 1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - 2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - 3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- 4. Shielded, Non-Pressure Transition Couplings:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1) Cascade Waterworks Mfg. Co.
 - 2) Mission Rubber Company, LLC; a division of MCP Industries
 - b. Standard: ASTM C 1460.
 - c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
- 5. Pressure Transition Couplings:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1) Dresser, Inc.
 - 2) Ford Meter Box Company, Inc. (The)
 - 3) Smith, Jay R. Mfg. Co.
 - b. Standard: AWWA C219.
 - c. Description: Metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
 - d. Center-Sleeve Material: Manufacturer's standard.
 - e. Gasket Material: Natural or synthetic rubber.
 - f. Metal Component Finish: Corrosion-resistant coating or material.
- B. Dielectric Fittings:
 - 1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
 - 2. Dielectric Unions:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1) Watts; a Watts Water Technologies company
 - 2) Wilkins
 - 3) Zurn Industries, LLC
 - b. Description:

- 1) Standard: ASSE 1079.
 - 2) Pressure Rating: 125 psig minimum at 180 deg F.
 - 3) End Connections: Solder-joint copper alloy and threaded ferrous.
3. Dielectric Flanges:
- a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1) Watts; a Watts Water Technologies company
 - 2) Wilkins
 - 3) Zurn Industries, LLC
 - b. Description:
 - 1) Standard: ASSE 1079.
 - 2) Factory-fabricated, bolted, companion-flange assembly.
 - 3) Pressure Rating: 150 psig.
 - 4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
4. Dielectric-Flange Insulating Kits:
- a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1) Advance Products & Systems, Inc.
 - 2) Calpico, Inc.
 - 3) Central Plastics Company
 - 4) Pipeline Seal and Insulator, Inc.
 - b. 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.
5. Dielectric Nipples:
- a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1) Elster Perfection Corporation
 - 2) Grinnell Mechanical Products
 - 3) Matco-Norca
 - 4) Precision Plumbing Products, Inc.
 - 5) Victaulic Company
 - b. 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. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep one-quarter ($\frac{1}{4}$) bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two (2) fixtures are installed back-to-back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- K. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

- L. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Drain: Two percent (2%) downward in direction of flow for piping NPS 3 and smaller; one percent (1%) downward in direction of flow for piping NPS 4 and larger.
 - 2. Horizontal Sanitary Drainage Piping: Two percent (2%) downward in direction of flow.
 - 3. Vent Piping: One percent (1%) down toward vertical fixture vent or toward vent stack.
 - M. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - 1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.
 - N. Install steel piping according to applicable plumbing code.
 - O. Install stainless-steel piping according to ASME A112.3.1 and applicable plumbing code.
 - P. Install aboveground PVC piping according to ASTM D 2665.
 - Q. Install underground PVC piping according to ASTM D 2321.
 - R. Plumbing Specialties:
 - 1. Install backwater valves in sanitary waster gravity-flow piping. Comply with requirements for backwater valves specified in Section 221319 "Sanitary Waste Piping Specialties."
 - 2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
 - 3. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."
 - S. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
 - T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."
- 3.2 JOINT CONSTRUCTION
- A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
 - B. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.

- C. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- E. Plastic, Non-Pressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.3 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
 - 1. Install transition couplings at joints of piping with small differences in OD's.
 - 2. In Drainage Piping: Shielded, non-pressure transition couplings.
 - 3. In Aboveground Force Main Piping: Fitting-type transition couplings.
 - 4. In Underground Force Main Piping:
 - a. NPS 1-1/2 and Smaller: Fitting-type transition couplings.
 - b. NPS 2 and Larger: Pressure transition couplings.
- B. Dielectric Fittings:
 - 1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
 - 2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.
 - 3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.
 - 4. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.4 VALVE INSTALLATION

- A. Shutoff Valves:
 - 1. Install shutoff valve on each sewage pump discharge.
 - 2. Install gate or full-port ball valve for piping NPS 2 and smaller.
 - 3. Install gate valve for piping NPS 2-1/2 and larger.
- B. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
 3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
 4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
 5. Vertical Piping: MSS Type 8 or Type 42, clamps.
 6. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 8. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced one (1) size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
 2. NPS 3: 60 inches with 1/2-inch rod.
 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
 4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
 5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
 6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- F. Install supports for vertical cast-iron soil piping every 15 feet.
- G. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
 2. NPS 3: 48 inches with 1/2-inch rod.
 3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
 4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
 5. NPS 10 and NPS 12: 48 inches with 7/8-inch rod.
- H. Install supports for vertical PVC piping every 48 inches.

- I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
 - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by Plumbing Code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by Plumbing Code.
 - 4. 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 Section 221319 "Sanitary Waste Piping Specialties."
 - 6. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.
- D. Connect force-main piping to the following:
 - 1. Sanitary Sewer: To exterior force main.
 - 2. Sewage Pump: To sewage pump discharge.
- E. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- F. 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.

3.7 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 6. Prepare reports for tests and required corrective action.
- E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.
 3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 4. Prepare reports for tests and required corrective action.

3.9 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Exposed ABS and PVC Piping: Protect plumbing vents exposed to sunlight with two (2) coats of water-based latex paint.

3.10 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Refer to Schedules on Drawings.

END OF SECTION 221316

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Cleanouts.
- 2. Floor drains.

1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. FOG: Fats, oils, and greases.
- C. FRP: Fiberglass-reinforced plastic.
- D. HDPE: High-density polyethylene plastic.
- E. PE: Polyethylene plastic.
- F. PP: Polypropylene plastic.
- G. PVC: Polyvinyl chloride plastic.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:
- B. Shop Drawings: Show fabrication and installation details for frost-resistant vent terminals.
 - 1. Wiring Diagrams: Power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.8 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."
- B. Coordinate size and location of roof penetrations.

1.9 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts:

1. ASME A112.36.2M, Cast-Iron Cleanouts:

- a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

- 1) Josam Company
- 2) Smith, Jay R. Mfg. Co.
- 3) Tyler Pipe; a subsidiary of McWane Inc.
- 4) Zurn Industries, LLC

- 2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
- 3. Size: Same as connected drainage piping
- 4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch as required to match connected piping.
- 5. Closure: Countersunk or raised-head, brass plug.
- 6. Closure Plug Size: Same as or not more than one (1) size smaller than cleanout size.

B. Metal Floor Cleanouts:

1. ASME A112.36.2M, Cast-Iron Cleanouts:

- a. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1) Josam Company
 - 2) Smith, Jay R. Mfg. Co.
 - 3) Tyler Pipe; a subsidiary of McWane Inc.
 - 4) Zurn Industries, LLC
 2. Standard: ASME A112.36.2M for heavy-duty, adjustable housing cleanout.
 3. Size: Same as connected branch.
 4. Type: Heavy-duty, adjustable housing.
 5. Body or Ferrule: Cast iron.
 6. Clamping Device: Required.
 7. Outlet Connection: Inside caulk.
 8. Closure: Brass plug with tapered threads.
 9. Adjustable Housing Material: Cast iron with threads.
 10. Frame and Cover Material and Finish: Polished bronze.
 11. Frame and Cover Shape: Round.
 12. Top Loading Classification: Heavy duty.
 13. Riser: ASTM A 74, Extra-Heavy class, cast-iron drainage pipe fitting and riser to cleanout.
 14. Standard: ASME A112.3.1.
 15. Size: Same as connected branch.
 16. Housing: Stainless-steel.
 17. Closure: Stainless-steel with seal.
 18. Riser: Stainless-steel drainage pipe fitting to cleanout.
- C. Cast-Iron Wall Cleanouts:
1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Josam Company
 - b. Smith, Jay R. Mfg. Co.
 - c. Tyler Pipe; a subsidiary of McWane Inc.
 - d. Zurn Industries, LLC
 2. Standard: ASME A112.36.2M. Include wall access.
 3. Size: Same as connected drainage piping.
 4. Body: Hub-and-spigot, cast-iron soil pipe T-branch as required to match connected piping.
 5. Closure: Countersunk or raised-head, brass plug.
 6. Closure Plug Size: Same as or not more than one (1) size smaller than cleanout size.
 7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
 8. Wall Access: Square, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Josam Company
 - b. Smith, Jay R. Mfg. Co.
 - c. Tyler Pipe; a subsidiary of McWane Inc.
 - d. Zurn Industries, LLC
2. Standard: ASME A112.6.3.
3. Pattern: Floor drain.
4. Body Material: Gray iron.
5. Seepage Flange: Required.
6. Anchor Flange: Required.
7. Clamping Device: Required.
8. Outlet: Bottom.
9. Sediment Bucket: Not required.
10. Top or Strainer Material: Nickel bronze.
11. Top of Body and Strainer Finish: Nickel bronze.
12. Top Shape: Square.
13. Top Loading Classification: Heavy duty.
14. Funnel: Not required.
15. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
16. Trap Material: Cast iron.
17. Trap Pattern: Deep-seal P-trap.
18. Trap Features: Trap-seal primer valve drain connection.

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. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
 - a. Radius, 30 Inches or Less: Equivalent to one percent (1%) slope, but not less than ¼-inch total depression.
 - b. Radius, 30 to 60 Inches: Equivalent to one percent (1%) slope.
 - c. Radius, 60 Inches or Larger: Equivalent to one percent (1%) slope, but not greater than 1-inch total depression.
 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- E. 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.
- F. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

3.2 CONNECTIONS

- A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" 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. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance. Refer to Section 017900 "Demonstration and Training."

END OF SECTION 221319

SECTION 224213.13 - COMMERCIAL WATER CLOSETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Flushometer valves.

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 water closets.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

- B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flushometer valves to include in operation and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.

- 1. Flushometer-Valve Repair Kits: Equal to ten percent (10%) of amount of each type installed, but no fewer than four (4) of each type.

PART 2 - PRODUCTS

2.1 FLUSHOMETER VALVES

- A. Lever-Handle, Piston Flushometer Valves:

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide product as indicated on Fixture Schedule (refer to Plumbing Drawings) or comparable product by one (1) of the following:

- a. Sloan Valve Company
 - b. TOTO USA, INC.
 - c. Zurn Industries, LLC
2. Standard: ASSE 1037.
 3. Minimum Pressure Rating: 125 psig.
 4. Features: Include integral check stop and backflow-prevention device.
 5. Material: Brass body with corrosion-resistant components.
 6. Exposed Flushometer-Valve Finish: Chrome plated.
 7. Panel Finish: Chrome plated or stainless-steel.
 8. Style: Exposed.
 9. Consumption: 1.28 gal. per flush.
 10. Minimum Inlet: NPS 1.
 11. Minimum Outlet: NPS 1-1/4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.
- B. Examine walls and floors for suitable conditions where water closets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Water-Closet Installation:
 1. Install level and plumb according to roughing-in drawings.
 2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
 3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.
- B. Flushometer-Valve Installation:
 1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
 2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
 3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
 4. Install actuators in locations that are easy for people with disabilities to reach.
 5. Install fresh batteries in battery-powered, electronic-sensor mechanisms.
- C. Install toilet seats on water closets.
- D. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

E. Joint Sealing:

1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to water-closet color.
3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

- A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.4 ADJUSTING

- A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.
- B. Adjust water pressure at flushometer valves to produce proper flow.
- C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

- A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed water closets and fittings.
- C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.13

SECTION 224213.16 - COMMERCIAL URINALS

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. Urinals.
 - 2. Flushometer valves.

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 urinals.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flushometer valves to include in operation and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Flushometer-Valve Repair Kits: Equal to ten percent (10%) of amount of each type installed, but no fewer than six (6) of each type.

PART 2 - PRODUCTS

2.1 WALL-HUNG URINALS

- A. Urinals: Wall hung, back outlet, washout, accessible.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product as indicated on Fixture Schedule (refer to Plumbing Drawings) or comparable product by one (1) of the following:

- a. Kohler Co.
 - b. TOTO USA, INC.
 - c. Zurn Industries, LLC
2. Fixture:
- a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
 - b. Material: Vitreous china.
 - c. Type: Washout with extended shields.
 - d. Strainer or Trapway: Manufacturer's standard strainer with integral trap.
 - e. Water Consumption: Low.
 - f. Spud Size and Location: NPS 3/4, top.
 - g. Outlet Size and Location: NPS 2, back.
 - h. Color: White.
3. Waste Fitting:
- a. Standard: ASME A112.18.2/CSA B125.2 for coupling.
 - b. Size: NPS 2.
4. Support: ASME A112.6.1M, Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include rectangular, steel uprights.

2.2 URINAL FLUSHOMETER VALVES

A. Lever-Handle, Piston Flushometer Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product as indicated on Fixture Schedule (refer to Plumbing Drawings) or comparable product by one (1) of the following:
 - a. Sloan Valve Company
 - b. TOTO USA, INC.
 - c. Zurn Industries, LLC
2. Standard: ASSE 1037.
3. Minimum Pressure Rating: 125 psig.
4. Features: Include integral check stop and backflow-prevention device.
5. Material: Brass body with corrosion-resistant components.
6. Exposed Flushometer-Valve Finish: Chrome plated.
7. Panel Finish: Chrome plated or stainless-steel.
8. Style: Exposed.
9. Consumption: 0.125 gal. per flush.
10. Minimum Inlet: NPS 3/4.
11. Minimum Outlet: NPS 3/4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before urinal installation.
- B. Examine walls and floors for suitable conditions where urinals will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Urinal Installation:

- 1. Install urinals level and plumb according to roughing-in drawings.
- 2. Install wall-hung, back-outlet urinals onto waste fitting seals and attached to supports.
- 3. Install wall-hung, bottom-outlet urinals with tubular waste piping attached to supports.
- 4. Install accessible, wall-mounted urinals at mounting height for the handicapped/elderly, according to ICC/ANSI A117.1.
- 5. Install trap-seal liquid in waterless urinals.

B. Support Installation:

- 1. Install supports, affixed to building substrate, for wall-hung urinals.
- 2. Use off-floor carriers with waste fitting and seal for back-outlet urinals.
- 3. Use carriers without waste fitting for urinals with tubular waste piping.
- 4. Use chair-type carrier supports with rectangular steel uprights for accessible urinals.

C. Flushometer-Valve Installation:

- 1. Install flushometer-valve water-supply fitting on each supply to each urinal.
- 2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
- 3. Install lever-handle flushometer valves for accessible urinals with handle mounted on open side of compartment.
- 4. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

D. Wall Flange and Escutcheon Installation:

- 1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations.
- 2. Install deep-pattern escutcheons if required to conceal protruding fittings.
- 3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

E. Joint Sealing:

- 1. Seal joints between urinals and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
- 2. Match sealant color to urinal color.
- 3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

- A. Connect urinals with water supplies and soil, waste, and vent piping. Use size fittings required to match urinals.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to urinals, allow space for service and maintenance.

3.4 ADJUSTING

- A. Operate and adjust urinals and controls. Replace damaged and malfunctioning urinals, fittings, and controls.
- B. Adjust water pressure at flushometer valves to produce proper flow.
- C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

- A. Clean urinals and fittings with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed urinals and fittings.
- C. Do not allow use of urinals for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.16

SECTION 224233 - WASH FOUNTAINS

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. Semicircular wash fountains.
 - 2. Linear wash fountains.

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 wash fountains.
 - 2. Include rated capacities, operating characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For each type of wash fountain.
 - 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. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wash fountains and components to include in operation and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Faucet Washers and O-Rings: Equal to ten percent (10%) of quantity of each type and size installed.
 - 2. Faucet Cartridges and O-Rings: Equal to five percent (5%) of quantity of each type and size installed.

PART 2 - PRODUCTS

2.1 SOLID-SURFACE, SEMICIRCULAR WASH FOUNTAINS

A. Wash Fountains: Off-floor, solid-surface, semicircular receptor.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bradley Corporation; or a comparable product by one (1) of the following:

- a. Acorn Engineering Company
- b. Intersan Manufacturing Company
- c. Sloan Valve Company
- d. Willoughby Industries

2. Standard: IAPMO IGC 156.

3. Receptor:

- a. Standard: ICPA SS-1 for solid-surface receptor.
- b. Height to Rim: 34 inches above floor.
- c. Drain: Grid with NPS 1-1/2 tailpiece.

4. Spray Head:

- a. Material: Stainless-steel or integral part of receptor back.
- b. Number of User Stations: Two (2) and three (3).
- c. Spray Nozzles: Chrome-plated brass or stainless-steel complying with NSF 61 Annex G and ASME A112.18.1/CSA B125.1.
- d. Control: Individual, hardwired sensor actuation with thermostatic mixing valve complying with ASSE 1016 and having check stops; comply with NSF 61 Annex G.
- e. Sensor: ASME A112.18.1/CSA B125.1 and UL 1951.

5. Supply Fittings:

- a. Piping: NPS 1/2 copper tubing.
- b. Valves: Shutoff valve on each supply.
- c. Supply Piping: From wall.

6. Waste Fittings:

- a. Standard: ASME A112.18.2/CSA B125.2.
- b. Trap and Drain Piping: NPS 2.
- c. Vent Piping: NPS 1-1/2 to ceiling.

7. Off-Floor Mounting: Wall bracket and ASME A112.6.1M, Type II urinal carrier.

2.2 SOLID-SURFACE, LINEAR WASH FOUNTAINS

A. Wash Fountains: Solid-surface, linear (side-by-side) receptor.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bradley Corporation or comparable product by one (1) of the following:

- a. Acorn Engineering Company
 - b. Intersan Manufacturing Company
 - c. Sloan Valve Company
 - d. Willoughby Industries
2. Standard: IAPMO IGC 156.
 3. Bowl(s) and Counter:
 - a. Standard: ICPA SS-1 for solid-surface bowls.
 - b. Height to Rim: 34 inches above floor.
 - c. Number of Bowls: One (1).
 - d. Drain: Grid with NPS 1-1/2 tailpiece, each bowl.
 4. Faucets:
 - a. Standards: ASME A112.18.1/CSA B125.1 and NSF 61 Annex G.
 - b. Type: Manufacturer's standard, chrome-plated solid brass, each bowl.
 - c. Control: Hardwired, sensor-actuated mixing valve with check stops for each user station.
 - d. Sensor: ASME A112.18.1/CSA B125.1 and UL 1951.
 5. Supply Fittings:
 - a. Piping: NPS 1/2 copper tubing, each bowl.
 - b. Valves: Shutoff valve on each supply.
 - c. Supply Piping: From wall.
 6. Waste Fittings:
 - a. Standard: ASME A112.18.2/CSA B125.2.
 - b. Trap and Drain Piping: NPS 1-1/2, each bowl.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water-supply, sanitary drainage, and vent piping systems to verify actual locations of piping connections before wash-fountain installation.
- B. Examine walls and floors for suitable conditions where wash fountains will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install wash fountains level and plumb according to roughing-in drawings.
- B. Set freestanding wash fountains on floor.
- C. Install off-floor carrier supports, affixed to building substrate, for wall-mounted wash fountains.

- D. Install accessible, wall-mounted wash fountains at mounting height for handicapped/elderly according to ICC A117.1.
- E. Install water-supply piping with shutoff valve on each supply to each wash fountain to be connected to domestic-water distribution piping. Use ball or gate valve. Install valves in locations where they can be easily reached for operation.
- F. Install trap and waste piping on each drain outlet of each wash fountain to be connected to sanitary drainage system.
- G. 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."
- H. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

- A. Connect wash fountains with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with requirements for water piping specified in Section 221116 "Domestic Water Piping."
- C. Comply with requirements for soil and waste drainage piping and vent piping specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Install protective-shielding pipe covers and enclosures on exposed supplies and waste piping of accessible wash fountains. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.4 ADJUSTING

- A. Operate and adjust wash fountains and controls. Replace damaged and malfunctioning wash fountains, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.
- C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

- A. After installing wash fountains, inspect and repair damaged finishes.
- B. Clean wash fountains, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed wash fountains and fittings.

- D. Do not allow use of wash fountains for temporary facilities unless approved in writing by Owner.

END OF SECTION 224233

SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on AC power systems up to 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.
- B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Energy efficient, as defined in NEMA MG 1.

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

- C. Service Factor: 1.15.
- D. Multispeed Motors: Variable torque.
 - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
 - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
- E. Multispeed Motors: Separate winding for each speed.
- F. Rotor: Random-wound, squirrel cage.
- G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- H. Temperature Rise: Match insulation rating.
- I. Insulation: Class B.
- J. Code Letter Designation:
 - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
 - 2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
- K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- B. Motors Used with Variable Frequency Controllers: Match to the characteristics of the equipment.
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
 - 2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - 3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
 - 4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
- C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one (1) 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.

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

- 4. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Pre-lubricated, 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 Used)

END OF SECTION 230513

SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Sleeves.
- 2. Stack-sleeve fittings.
- 3. Sleeve-seal systems.
- 4. Sleeve-seal fittings.
- 5. Grout.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

2.2 STACK-SLEEVE FITTINGS

- A. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

- A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Non-shrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 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 3-inch above finished floor level.
 2. Using grout, 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 ¼-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. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

- A. Install stack-sleeve fittings in new slabs as slabs are constructed.
 1. Install fittings that are large enough to provide ¼-inch annular clear space between sleeve and pipe or pipe insulation.
 2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing.
 3. Install section of cast-iron soil pipe to extend sleeve to 3 inches above finished floor level.
 4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 5. Using grout, seal the space around outside of stack-sleeve fittings.
- B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials.

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 1. Concrete Slabs-on-Grade:

SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

- a. Piping Smaller Than NPS 6 Cast-Iron wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - b. Piping NPS 6 and Larger: Cast-Iron wall pipe.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
2. Concrete Slabs above Grade:
- a. Piping Smaller Than NPS 6: Cast-Iron wall pipe.
 - b. Piping NPS 6 and Larger: Cast-Iron wall pipe.
3. Interior Partitions:
- a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
 - b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 230517

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Metal framing systems.
- 2. Fastener systems.

B. Related Sections:

- 1. Section 233113 "Metal Ducts" for duct hangers and supports.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

- B. Structural Performance: Hangers and supports for HVAC ducts shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

- 1. Design duct supports capable of supporting combined operating weight of supported duct, and insulation.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

- 1. Metal framing systems.

- C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

- 1. Detail fabrication and assembly of duct support system.
- 2. Design Calculations: Calculate requirements for designing duct support system.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following
 - a. Flex-Strut Inc.
 - b. GS Metals Corp.
 - c. Unistrut Corporation; Tyco International, Ltd.
2. Description: Shop- or field-fabricated duct-support assembly for supporting ducts.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Metallic Coating: Hot-dipped galvanized.
7. Paint Coating: Alkyd.

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Anvil International; a subsidiary of Mueller Water Products Inc.
 - b. Empire Industries, Inc.
 - c. Haydon Corporation; H-Strut Division
2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Coating: Zinc rich paint.

2.2 FASTENERS

- A. General: Unless otherwise indicated, provide stainless-steel bolts and nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and flat zinc plated washers.

2.3 DUCT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes. Supports shall be painted after fabrication and have any bare spots touched-up after assembly.

2.4 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36, carbon-steel plates, shapes, and bars; black and galvanized.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Framing System Installation: Arrange for duct runs and support together on field-assembled metal framing systems.
- B. Install duct support systems with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for duct supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of supports to 1½ inches.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MFMA-103 for metal framing system selections and applications.

END OF SECTION 230529

SECTION 230548 - VIBRATION CONTROLS 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. Open-spring isolators.
 - 2. Housed-spring isolators.
 - 3. Restrained-spring isolators.
 - 4. Housed-restrained-spring isolators.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
 - 2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device type required.
- B. Shop Drawings:
 - 1. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
 - 2. 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.
- C. Delegated-Design Submittal: For each vibration isolation device.
 - 1. Include design calculations for selecting vibration isolators and for designing vibration isolation bases.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show coordination of vibration isolation device installation for HVAC piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.
- B. Qualification Data: For testing agency.
- C. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 OPEN-SPRING ISOLATORS

- A. Freestanding, Laterally Stable, Open-Spring Isolators:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Kinetics Noise Control, Inc.
 - b. Mason Industries, Inc.
 - c. Vibration Eliminator Co., Inc.
 - 2. Outside Spring Diameter: Not less than eighty percent (80%) of the compressed height of the spring at rated load.
 - 3. Minimum Additional Travel: Fifty percent (50%) of the required deflection at rated load.
 - 4. Lateral Stiffness: More than eighty percent (80%) of rated vertical stiffness.
 - 5. Overload Capacity: Support two hundred percent (200%) of rated load, fully compressed, without deformation or failure.
 - 6. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to 500 psig.
 - 7. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

2.2 HOUSED-SPRING ISOLATORS

- A. Freestanding, Laterally Stable, Open-Spring Isolators in Two-Part Telescoping Housing:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Kinetics Noise Control, Inc.
 - b. Mason Industries, Inc.
 - c. Vibration Eliminator Co., Inc.
 - 2. Outside Spring Diameter: Not less than eighty percent (80%) of the compressed height of the spring at rated load.
 - 3. Minimum Additional Travel: Fifty percent (50%) of the required deflection at rated load.
 - 4. Lateral Stiffness: More than eighty percent (80%) of rated vertical stiffness.
 - 5. Overload Capacity: Support two hundred percent (200%) of rated load, fully compressed, without deformation or failure.
 - 6. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators.

- a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
- b. Top housing with threaded mounting holes and internal leveling device.

2.3 RESTRAINED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Kinetics Noise Control, Inc.
 - b. Mason Industries, Inc.
 - c. Vibration Eliminator Co., Inc.
2. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.
 - a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
 - b. Top plate with threaded mounting holes.
 - c. Internal leveling bolt that acts as blocking during installation.
3. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
4. Outside Spring Diameter: Not less than eighty percent (80%) of the compressed height of the spring at rated load.
5. Minimum Additional Travel: Fifty percent (50%) of the required deflection at rated load.
6. Lateral Stiffness: More than eighty percent (80%) of rated vertical stiffness.
7. Overload Capacity: Support two hundred percent (200%) of rated load, fully compressed, without deformation or failure.

2.4 HOUSED-RESTRAINED-SPRING ISOLATORS

A. Freestanding, Steel, Open-Spring Isolators with Vertical-Limit Stop Restraint in Two-Part Telescoping Housing:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Kinetics Noise Control, Inc.
 - b. Mason Industries, Inc.
 - c. Vibration Eliminator Co., Inc.
2. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators. Housings are equipped with adjustable snubbers to limit vertical movement.
 - a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
 - b. Threaded top housing with adjustment bolt and cap screw to fasten and level equipment.

3. Outside Spring Diameter: Not less than eighty percent (80%) of the compressed height of the spring at rated load.
4. Minimum Additional Travel: Fifty percent (50%) of the required deflection at rated load.
5. Lateral Stiffness: More than eighty percent (80%) of rated vertical stiffness.
6. Overload Capacity: Support two hundred percent (200%) of rated load, fully compressed, without deformation or failure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

END OF SECTION 230548

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Equipment labels.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
 - 1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8-inch-thick, and having predrilled holes for attachment hardware.
 - 2. Letter Color: Black.
 - 3. Background Color: White.
 - 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

5. Minimum Label Size: Length and width vary for required label content, but not less than 2½ by ¾ inches.
 6. Minimum Letter Size: ¼-inch or name of units if viewing distance is less than 24 inches and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8½-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment 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 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Balancing Air Systems:
 - a. Toilet room exhaust air systems.
 - 2. Balancing Hydronic Systems:
 - a. Constant-flow hydronic system.

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 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within thirty (30) days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within forty-five (45) days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
- C. Strategies and Procedures Plan: Within thirty (30) days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- D. Certified TAB reports.
- E. Sample report forms.
- F. 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 Contractor Qualifications: Engage a TAB entity certified by AABC
 1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC.
 2. TAB Technician: Employee of the TAB contractor and who is certified by AABC as a TAB technician.
- B. TAB Conference: Meet with Owner on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Require the participation of the TAB field supervisor and technicians. Provide seven (7) days advance notice of scheduled meeting time and location.
 1. Agenda Items:
 - a. The Contract Documents examination report.
 - b. The TAB plan.
 - c. Coordination and cooperation of trades and subcontractors.
 - d. Coordination of documentation and communication flow.
- C. Certify TAB field data reports and perform the following:
 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
- D. TAB Report Forms: Use standard TAB contractor's forms.
- E. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."
- F. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- G. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.6 PROJECT 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.

1.7 COORDINATION

- A. Notice: Provide seven (7) days advance notice for each test. Include scheduled test dates and times.
- B. Perform TAB after leakage and pressure tests on air distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Used)

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, and manual volume dampers. Verify that locations of these balancing devices 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 equipment performance data fan 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.
- 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 HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- I. Examine operating safety interlocks and controls on HVAC equipment.
- J. 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. Permanent electrical-power wiring is complete.
 - 2. Automatic temperature-control systems are operational.
 - 3. Equipment and duct access doors are securely closed.
 - 4. Balance, smoke, and fire dampers are open.
 - 5. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's National Standards for Total System Balance and in this Section.
 - 1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- B. Cut insulation, ducts for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Duct Accessories."
 - 2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation".
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" 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. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR BATHROOM EXHAUST 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. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.
 - 2. Measure fan static pressures as follows to determine actual static pressure:
 - a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure static pressure directly at the fan outlet or through the flexible connection.
 - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
 - 3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 - 4. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 - 5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
 - 1. Measure airflow of submain and branch ducts.
 - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
 - 2. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
 - 3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

- C. Measure air outlets and inlets without making adjustments.
 - 1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.
 - 1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 - 2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 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 expansion tank for proper setting.
 - 2. Check highest vent for adequate pressure.
 - 3. Check flow-control valves for proper position.
 - 4. Locate start-stop and disconnect switches, electrical interlocks, and motor controllers.
 - 5. Verify that motor controllers are equipped with properly sized thermal protection.
 - 6. 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.

3.7 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS (FOR HOT WATER CONVERSIONS)

- A. Adjust pumps to deliver total design flow.
 - 1. Measure total water flow.
 - a. Position valves for full flow through coils.
 - b. Measure flow by main flow meter, if installed.
 - c. If main flow meter is not installed, determine flow by pump TDH or known equipment pressure drop.

2. Measure pump TDH as follows:
 - a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - c. Convert pressure to head and correct for differences in gauge heights.
 - d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
 - e. With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved. If excessive throttling is required to achieve desired flow, recommend pump impellers be trimmed to reduce excess throttling.
 3. Monitor motor performance during procedures, and do not operate motor in an overloaded condition.
- B. Adjust flow-measuring devices installed in mains and branches to design water flows.
1. Measure flow in main and branch pipes.
 2. Adjust main and branch balance valves for design flow.
 3. Re-measure each main and branch after all have been adjusted.
- C. Adjust flow-measuring devices installed at terminals for each space to design water flows.
1. Measure flow at terminals.
 2. Adjust each terminal to design flow.
 3. Re-measure each terminal after it is adjusted.
 4. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
 5. Perform temperature tests after flows have been balanced.
- D. For systems with pressure-independent valves at terminals:
1. Measure differential pressure and verify that it is within manufacturer's specified range.
 2. Perform temperature tests after flows have been verified.
- E. For systems without pressure-independent valves or flow-measuring devices at terminals:
1. Measure and balance coils by either coil pressure drop or temperature method.
 2. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
- F. Verify final system conditions as follows:
1. Re-measure and confirm that total water flow is within design.
 2. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
 3. Mark final settings.
- G. Verify that memory stops have been set.

3.8 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Smaller: Test at final balanced conditions and record the following data:
 - 1. Manufacturer's name, model number, and serial number.
 - 2. Motor horsepower rating.
 - 3. Motor rpm.
 - 4. Efficiency rating.
 - 5. Nameplate and measured voltage, each phase.
 - 6. Nameplate and measured amperage, each phase.
 - 7. Starter thermal-protection-element rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.9 TOLERANCES

- A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus five percent (+/- 5%).
 - 2. Air Outlets and Inlets: Plus, or minus ten percent (+/- 5%).
 - 3. Heating-Hot Water Flow Rates: Plus, or minus five percent (+/-5%). If design value is less than 10 GPM, within ten percent (10%).

3.10 REPORTING.

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

3.11 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. Fan 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. 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 return, and exhaust-air dampers.
 - b. Fan drive settings including settings and percentage of maximum pitch diameter.
 - c. Other system operating conditions that affect performance.
- D. Fan Test Reports: For supply, return, and exhaust fans, include the following:
1. Fan Data/Pump Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - g. Sheave make, size in inches, and bore.
 - h. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.

- f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - g. Number, make, and size of belts.
3. Test Data (Indicated and Actual Values):
- a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.
 - f. Total water flow.
 - g. Total pump head.
 - h. Convactor flow rates.

3.12 INSPECTIONS

A. Initial Inspection:

- 1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
- 2. Check the following for each system:
 - a. Measure airflow of at least five percent (5%) of air outlets.
 - b. Verify that balancing devices are marked with final balance position.
 - c. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

- 1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect.
- 2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Owner.
- 3. 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."
- 4. If the number of "FAILED" measurements is greater than ten percent (10%) of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

- 1. 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 contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

3.13 ADDITIONAL TESTS

A. Within ninety (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 250593

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 insulating the following duct services:
 - 1. Indoor, concealed exhaust.
 - 2. Indoor, exposed exhaust.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail insulation application at elbows, fittings, dampers, specialties, and flanges for each type of insulation.
 - 2. Detail application of field-applied jackets.
- C. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:
 - 1. Sheet Form Insulation Materials: 12 inches square.
 - 2. Sheet Jacket Materials: 12 inches square.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

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 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.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," 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. Extruded Polystyrene Board Insulation: Comply with ASTM C 578, Type X, 15 psi minimum compressive strength, 1.30 lb/cu. ft.

1. Thermal Resistance: (180-day real-time aging as mandated by ASTM C 578, measured per ASTM C 518 at mean temperature of 75F): R-5.0 per inch of thickness, with ninety percent (90%) lifetime limited warranty on thermal resistance.
2. Edge condition: Shall be square.
3. Products: Subject to compliance with requirements, provide one (1) of the following:
 - a. Owens Corning
 - b. Johns Manville
 - c. Knauf Insulation

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.

2.3 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. Products: Subject to compliance with requirements, provide one (1) of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **CP-10**
 - b. Eagle Bridges - Marathon Industries; **550**
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **46-50**
 2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F
 4. Solids Content: Sixty percent (60%) by volume and sixty-six percent (66%) by weight.
 5. Color: White.

2.4 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM E 96, ASTM D 1000, unless otherwise indicated.

2.5 TAPES

- A. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive to be used to eliminate gaps in between the insulation boards.
 1. Products: Subject to compliance with requirements, provide one (1) of the following:
 - a. ABI, Ideal Tape Division; **488 AWF**
 - b. Avery Dennison Corporation, Specialty Tapes Division; **Fasson 0800**
 - c. Compac Corporation; **120**
 2. Width: 2 inches.

3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: Five percent (5%).
6. Tensile Strength: 34 lbf/inch in width.

2.6 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, provide one (1) of the following:
 - a. ITW Insulation Systems; **Gerrard Strapping and Seals**
 - b. RPR Products, Inc.; **Insul-Mate Strapping, Seals, and Springs**
2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020-inch-thick, 3/4-inch-wide with closed seal.

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 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. Cut insulation in a manner to avoid compressing insulation more than seventy-five percent (75%) of its nominal thickness.
- L. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- M. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

- A. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant.
 - 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.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.6 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 - 1. Exhaust duct.
- B. Items Not Insulated:

1. Flexible connectors.

3.7 ABOVEGROUND, INDOOR EXHAUST DUCT INSULATION SCHEDULE

- A. Insulation materials and thicknesses are identified below. If more than one (1) material is listed for a duct system, selection from materials listed is Contractor's option.
- B. All exhaust air duct insulation shall be the following:
 1. Mineral-Fiber Blanket: Minimum installed R Value of 5 and 1 lb/cu. ft. nominal density, 1½-inch-thick.
 2. All exhaust ducts shall be insulated from the space all the way to the roof line.

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. Heating hot water piping.

- B. Related Sections:

- 1. Section 232113 "Hydronic Piping."

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

- 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
- 2. Detail 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.
- 6. Detail application of field-applied jackets.
- 7. Detail application at linkages of control devices.

- C. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use.

- 1. Preformed Pipe Insulation Materials: 12 inches long by NPS 2 (DN 50).
- 2. Sheet Form Insulation Materials: 12 inches square.
- 3. Jacket Materials for Pipe: 12 inches long by NPS 2 (DN 50).
- 4. Sheet Jacket Materials: 12 inches square.
- 5. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing 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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS**2.1 INSULATION MATERIALS**

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless-steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless-steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Products: Subject to compliance with requirements, provide one (1) of the following:
 - a. Johns Manville; **Micro-Lok**
 - b. Knauf Insulation; **1000-Degree Pipe Insulation**
 - c. Manson Insulation Inc.; **Alley-K**
 - d. Owens Corning; **Fiberglas Pipe Insulation**
 - 2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-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. Products: Subject to compliance with requirements, provide the following:
 - a. Ramco Insulation, Inc.; **Super-Stik**
- B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Ramco Insulation, Inc.; **Thermokote V**
- C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Ramco Insulation, Inc.; **Ramcote 1200** and **Quik-Cote**

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
1. Products: Subject to compliance with requirements, provide one (1) of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **CP-127**
 - b. Eagle Bridges - Marathon Industries; **225**
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **85-60/85-70**
 - d. Mon-Eco Industries, Inc.; **22-25**
 2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. Products: Subject to compliance with requirements provide one (1) of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **CP-82**
 - b. Eagle Bridges - Marathon Industries; **225**
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **85-50**
 - d. Mon-Eco Industries, Inc.; **22-25**
 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. PVC Jacket Adhesive: Compatible with PVC jacket.
1. Products: Subject to compliance with requirements, provide one (1) of the following:
 - a. Dow Corning Corporation; **739, Dow Silicone**
 - b. Johns Manville; **Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive**
 - c. P.I.C. Plastics, Inc.; **Welding Adhesive**
 - d. Speedline Corporation; **Polyco VP Adhesive**
 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.

1. Products: Subject to compliance with requirements, provide one (1) of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **Encacel**
 - b. Eagle Bridges - Marathon Industries; **570**
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **60-95/60-96**
2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F (Minus 46 to plus 104 deg C).
4. Solids Content: ASTM D 1644, thirty-three percent (33%) by volume and forty-six percent (46%) by weight.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Products: Subject to compliance with requirements, provide one (1) of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **CP-10**
 - b. Eagle Bridges - Marathon Industries; **550**
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **46-50**
 - d. Mon-Eco Industries, Inc.; **55-50**
 - e. Vimasco Corporation; **WC-1/WC-5**
2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: Sixty percent (60%) by volume and sixty-six percent (66%) by weight.
5. Color: White.

2.5 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass, Phenolic, and Polyisocyanurate Products: Subject to compliance with requirements, provide one (1) of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **CP-76**
 - b. Eagle Bridges - Marathon Industries; **405**
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **30-45**
 - d. Mon-Eco Industries, Inc.; **44-05**
 - e. Pittsburgh Corning Corporation; **Pittseal 444**

2. Joint Sealants for Polystyrene Products: Subject to compliance with requirements, provide one (1) of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **CP-70**
 - b. Eagle Bridges - Marathon Industries; **405**
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **30-45**
 - d. Mon-Eco Industries, Inc.; **44-05**
3. Materials shall be compatible with insulation materials, jackets, and substrates.
4. Permanently flexible, elastomeric sealant.
5. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
6. Color: White or gray.
7. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one (1) of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **CP-76**
 - b. Eagle Bridges - Marathon Industries; **405**
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **95-44**
 - d. Mon-Eco Industries, Inc.; **44-05**
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. ASJ Flashing Sealants, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; **CP-76**
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. ASJ: White, Kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.7 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
1. Products: Subject to compliance with requirements, provide one (1) of the following:
 - a. Johns Manville; **Zeston**
 - b. P.I.C. Plastics, Inc.; **FG Series**
 - c. Proto Corporation; **LoSmoke**
 - d. Speedline Corporation; **SmokeSafe**
 2. Adhesive: As recommended by jacket material manufacturer.
 3. Color: Color-code jackets based on system. Color as selected by Architect and Owner from manufacturer's entire range.
 4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.8 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
1. Products: Subject to compliance with requirements, provide one (1) of the following:
 - a. ABI, Ideal Tape Division; **428 AWF ASJ**
 - b. Avery Dennison Corporation, Specialty Tapes Division; **Fasson 0836**
 - c. Compac Corporation; **104 and 105**
 - d. Venture Tape; **1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ**
 2. Width: 3 inches.
 3. Thickness: 11.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: Two percent (2%).
 6. Tensile Strength: 40 lbf/inch in width.

7. 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. Products: Subject to compliance with requirements, provide one (1) of the following:
 - a. Compac Corporation; **130**
 - b. Venture Tape; **1506 CW NS**
 2. Width: 2 inches.
 3. Thickness: 6 mils.
 4. Adhesion: 64 ounces force/inch in width.
 5. Elongation: Five hundred percent (500%).
 6. Tensile Strength: 18 lbf/inch in width.
- C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Products: Subject to compliance with requirements, provide one (1) of the following:
 - a. ABI, Ideal Tape Division; **488 AWF**
 - b. Avery Dennison Corporation, Specialty Tapes Division; **Fasson 0800**
 - c. Compac Corporation; **120**
 - d. Venture Tape; **3520 CW**
 2. Width: 2 inches.
 3. Thickness: 3.7 mils.
 4. Adhesion: 100 ounces force/inch in width.
 5. Elongation: Five percent (5%).
 6. Tensile Strength: 34 lbf/inch in width.
- D. PVDC Tape for Outdoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.
1. Products: Subject to compliance with requirements, provide the following:
 - a. Dow Chemical Company (The); **Saran 560 Vapor Retarder Tape**
 2. Width: 3 inches.
 3. Film Thickness: 6 mils.
 4. Adhesive Thickness: 1.5 mils.
 5. Elongation at Break: One hundred forty-five percent (145%).
 6. Tensile Strength: 55 lbf/inch in width.

2.9 SECUREMENTS

- A. Bands:
1. Products: Subject to compliance with requirements, provide one (1) of the following:
 - a. ITW Insulation Systems; **Gerrard Strapping and Seals**
 - b. RPR Products, Inc.; **Insul-Mate Strapping, Seals, and Springs**

2. Stainless-Steel: ASTM A 167 or ASTM A 240, Type 304 ½-inch-wide with wing seal.
- B. Wire: 0.062-inch soft-annealed, stainless-steel.
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. C & F Wire

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 1½ 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 seventy-five percent (75%) of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Manholes.

5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
 1. Comply with requirements in Section 079200 "Joint Sealants" for joint sealers.
- 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.
- D. Insulation Installation at Floor Penetrations:
 1. Pipe: Install insulation continuously through floor penetrations.
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt

- each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two (2) times the thickness of pipe insulation, or one (1) 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 (2) times the thickness of pipe insulation, or one (1) 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 (2) times the thickness of pipe insulation, or one (1) 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 (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 (2) 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 (2) coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1-inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- #### A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe in accordance to manufacturers recommended procedure.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1-inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.9 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two (2) 0.062-inch-thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1½-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints, for horizontal applications. Seal with manufacturer's recommended adhesive.

1. Apply two (2) continuous beads of adhesive to seams and joints, one (1) bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.10 FINISHES

- A. Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below.
 - 1. Flat Acrylic Finish: Two (2) finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two (2) coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect and Owner from manufacturer's entire range. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. 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 (3) locations of straight pipe, three (3) locations of threaded fittings, three (3) locations of welded fittings, two (2) locations of threaded strainers, two (2) locations of welded strainers, three (3) locations of threaded valves, and three (3) locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.12 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one (1) material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Drainage piping located in crawl spaces.
 - 2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.13 INDOOR PIPING INSULATION SCHEDULE

- A. Heating-Hot-Water Supply and Return, 200 Deg F (93 Deg C) and Below:
 - 1. NPS 1 1/2 and Smaller: Insulation shall be:

- a. Mineral-Fiber, Preformed Pipe, Type I: 1½ inches thick.
- 2. NPS 1 3/4 and Larger: Insulation shall be:
 - a. Mineral-Fiber, Preformed Pipe, Type I: 2 inches thick.
- 3.14 INDOOR, FIELD-APPLIED JACKET SCHEDULE
 - A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket. If more than one (1) material is listed, selection from materials listed is Contractor's option.
 - B. Piping, Concealed:
 - 1. None.
 - C. Piping, Exposed:
 - 1. PVC, Color-Coded by System: 20 mils thick.

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. This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:
 - 1. Hot-water heating piping.
 - 2. Safety-valve-inlet and -outlet piping.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
 - 2. Hydronic specialties.
- B. Shop Drawings: Detail, at ¼ (1:50) scale, the piping layout, fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to the building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Welding certificates.
- C. Field quality-control test reports.
- D. Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project site.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Water-Treatment Chemicals: Furnish enough chemicals for initial system startup and for preventive maintenance for one year from date of Substantial Completion.

- B. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

1.7 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code - Steel."
- B. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 01.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Annealed-Temper Copper Tubing: ASTM B 88, Type K.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.

2.2 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.
- B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in Part 3 "Piping Applications" Article.
- C. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3 "Piping Applications" Article.
- D. Wrought-Steel Fittings: ASTM A 234, wall thickness to match adjoining pipe.
- E. 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.

-
- F. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.
 - G. Flexible Connectors: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket; 150-psig minimum working pressure and 250 deg F (121 deg C) maximum operating temperature. Connectors shall have flanged connections to match equipment connected and shall be capable of 3/4-inch misalignment.

2.3 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 thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.
- D. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- E. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.4 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Capitol Manufacturing Company
 - b. Central Plastics Company
 - c. Hart Industries International, Inc.
 - d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - e. Zurn Plumbing Products Group; AquaSpec Commercial Products Division
 - 2. Factory-fabricated union assembly, for 250-psig minimum working pressure at 180 deg F (82 deg C).
- D. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Capitol Manufacturing Company
 - b. Central Plastics Company
 - c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Factory-fabricated companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

E. Dielectric-Flange Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Central Plastics Company
 - d. Pipeline Seal and Insulator, Inc.
2. Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
3. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Calpico, Inc.
 - b. Lochinvar Corporation
2. Galvanized-steel coupling with inert and noncorrosive thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F (107 deg C).

G. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Perfection Corporation; a subsidiary of American Meter Company
 - b. Precision Plumbing Products, Inc.
 - c. Sioux Chief Manufacturing Company, Inc.
 - d. Victaulic Company of America
2. Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F (107 deg C).

2.5 VALVES

A. Bronze, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Bell & Gossett Domestic Pump; a division of ITT Industries
 - b. Flow Design Inc.
 - c. Griswold Controls
 - d. Taco
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 (121 deg C).

B. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Bell & Gossett Domestic Pump; a division of ITT Industries
 - b. Flow Design Inc.
 - c. Gerand Engineering Co.
 - d. Griswold Controls
 - e. Taco
2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
3. Ball: Brass or stainless-steel.
4. Stem Seals: EPDM O-rings.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: PTFE.
7. End Connections: Flanged or grooved.
8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
9. Handle Style: Lever, with memory stop to retain set position.
10. CWP Rating: Minimum 125 psig.
11. Maximum Operating Temperature: 250 deg F.

C. Automatic Flow-Control Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Flow Design Inc.

b. Griswold Controls

2. Body: Brass or ferrous metal.
3. Piston and Spring Assembly: Stainless-steel, tamper proof, self-cleaning, and removable.
4. Combination Assemblies: Include bronze or brass-alloy ball valve.
5. Identification Tag: Marked with zone identification, valve number, and flow rate.
6. Size: Same as pipe in which installed.
7. Performance: Maintain constant flow, plus or minus five percent (+/-5%) over system pressure fluctuations.
8. Minimum CWP Rating: 175 psig.
9. Maximum Operating Temperature: 200 deg F (93 deg C).

2.6 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: 60-mesh startup strainer and perforated stainless-steel basket with fifty percent (50%) free area.
4. CWP Rating: 125 psig.

B. Basket Strainers:

1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: 60-mesh startup strainer and perforated stainless-steel basket with fifty percent (50%) free area.
4. CWP Rating: 125 psig.

C. Stainless-Steel Bellow, Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F (121 deg C).

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Hot-water heating piping, aboveground, NPS 2 (DN 50) and smaller shall be one (1) of the following:
 1. Type L drawn-temper copper tubing, wrought-copper fittings, and brazed joints.

2. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
- B. Hot-water heating piping, aboveground, NPS 2-1/2 (DN 65) and larger, shall be the following:
1. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
- C. Air-Vent Piping:
1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.
 2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.
- D. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.

3.2 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 in the return pipe of each heating or cooling terminal.

3.3 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements. 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 (DN 20) ball valve, and short NPS 3/4 (DN 20) 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 branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.
- P. Install unions in piping, NPS 2 (DN 50) and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- Q. Install flanges in piping, NPS 2-1/2 (DN 65) and larger, at final connections of equipment and elsewhere as indicated.
- R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping".

3.4 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor devices are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment." Comply with the following requirements for maximum spacing of supports.
- B. Seismic restraints are specified in Section 230548 "Vibration Controls for HVAC."
- C. 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. Spring hangers to support vertical runs.

5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
 6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.
- D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
1. NPS 3/4 (DN 20): Maximum span, 6 feet; minimum rod size, 1/4-inch.
 2. NPS 1 (DN 25): Maximum span, 6 feet; minimum rod size, 1/4-inch.
 3. NPS 1-1/2 (DN 40): Maximum span, 6 feet; minimum rod size, 3/8-inch.
 4. NPS 2 (DN 50): Maximum span, 10 feet; minimum rod size, 3/8-inch.
 5. NPS 2-1/2 (DN 65): Maximum span, 11 feet; minimum rod size, 3/8-inch.
- E. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
1. NPS 3/4 (DN 20): Maximum span, 5 feet; minimum rod size, 1/4-inch.
 2. NPS 1 (DN 25): Maximum span, 6 feet; minimum rod size, 1/4-inch.
 3. NPS 1-1/2 (DN 40): Maximum span, 6 feet; minimum rod size, 3/8-inch.
 4. NPS 2 (DN 50): Maximum span, 8 feet; minimum rod size, 3/8-inch.
 5. NPS 2-1/2 (DN 65): Maximum span, 8 feet; minimum rod size, 3/8-inch.
- F. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

3.5 PIPE JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.6 HYDRONIC SPECIALTIES INSTALLATION

- A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

3.7 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 bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

3.8 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. 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.
 - 2. 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.
 - 3. Isolate expansion tanks and determine that hydronic system is full of water.
 - 4. 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 ninety percent (90%) of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."

5. 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.
6. 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. Set makeup pressure-reducing valves for required system pressure.
4. 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).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.

3.9 ADJUSTING

A. Mark calibrated nameplates of pump discharge valves after hydronic system balancing has been completed, to permanently indicate final balanced position.

B. Perform these adjustments 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 system 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 operation of automatic bypass valves.
7. Check and set operating temperatures of boilers, chillers, and cooling towers to design requirements.
8. Lubricate motors and bearings.

3.10 CLEANING

A. Flush hydronic-piping systems with clean water. Remove and clean or replace strainer screens. After cleaning and flushing hydronic-piping systems, but before balancing, remove disposable fine-mesh strainers in pump suction diffusers.

3.11 PIPE PRESSURE TEST

A. Perform at the end of each phase before connecting to existing piping.

B. Preparation for testing: Prepare hydronic piping in accordance with ASME 1331.a and as follows:

1. Leave joints including welds uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints, which cannot sustain the reactions due to test pressure. If temporary restraints are not practical, isolate expansion joints from testing.

3. Flush system with clean water. Clean strainers.
4. Isolate equipment that is not to be subjected to the test pressure from the piping. If a valve is used to isolate the equipment, its closure shall be capable of sealing against the test pressure without damage to the valve. Flanged joints at which blinds are inserted to isolate equipment need not be tested.
5. Install relief valve set at a pressure no more than 1/3 higher than the test pressure, to protect against damage by expansion of liquid or other source of overpressure during the test.

C. Testing: Test hydronic piping as follows:

1. Use ambient temperature water as the testing medium, except where there is a risk of damage due to freezing. Another liquid may be used if it is safe for workmen and compatible with the piping system components.
2. Use vents installed at high points in the system to release trapped air while filling the system. Use drains installed at low points for complete removal of the liquid.
3. Examine system to see that equipment and parts that cannot withstand test pressures are properly isolated. Examine test equipment to ensure that it is tight and that low-pressure filling lines are disconnected.
4. Subject piping system to a hydrostatic test pressure which at every point in the system is not less than 1.5 times the design pressure. The test pressure shall not exceed the maximum pressure for any vessel, pump, valve, or other component in the system under test. Make a check to verify that the stress due to pressure at the bottom of vertical runs does not exceed either ninety percent (90%) of specified minimum yield strength, or 1.7 times the "SE" value in Appendix A of ASME B31.9, Code For Pressure Piping, Building Services Piping.
5. After the 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 as appropriate, and repeat hydrostatic test until there are no leaks.

END OF SECTION 232113

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Single-wall rectangular ducts and fittings.
- 2. Sheet metal materials.
- 3. Sealants and gaskets.
- 4. Hangers and supports.

B. Related Sections:

- 1. Section 230593 “Testing, Adjusting, and Balancing” for testing, adjusting, and balancing requirements for metal ducts.
- 2. Section 233300 “Duct Accessories” for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

- 1. Liners and adhesives.
- 2. Sealants and gaskets.

B. Shop Drawings:

- 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work in 1/4-inch scale.
- 2. Factory- and shop-fabricated ducts and fittings.
- 3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
- 4. Fittings.
- 5. Reinforcement and spacing.
- 6. Seam and joint construction.
- 7. Equipment installation based on equipment being used on Project.
- 8. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code – Steel," for hangers and supports.
 - 2. AWS D1.2, "Structural Welding Code – Aluminum," for aluminum supports.
 - 3. AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
- C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 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."

2.2 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.
 - 1. Galvanized Coating Designation: G90.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.

- C. Reinforcement Shapes and Plates: ASTM A 36, steel plates, shapes, and bars; black and galvanized.
 - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

2.3 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:
 - 1. Application Method: Brush on.
 - 2. Solids Content: Minimum sixty-five percent (65%).
 - 3. Shore A Hardness: Minimum 20.
 - 4. Water resistant.
 - 5. Mold and mildew resistant.
 - 6. VOC: Maximum 75 g/L (less water).
 - 7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 - 8. Service: Indoor or outdoor.
- C. 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.
- D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.4 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards – Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- D. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- E. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

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 with fewest possible joints.
- D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- G. Install ducts with a clearance of 1-inch, plus allowance for insulation thickness.
- H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- I. 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 1½ inches.
- J. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Duct Accessories" for fire and smoke dampers.
- K. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless-steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

- A. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Conditioned Space, Exhaust Ducts: Seal Class B.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards – Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards – Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Duct Accessories".
- B. Comply with SMACNA's "HVAC Duct Construction Standards – Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
 - 1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
 - 2. Test the following systems:
 - a. Ducts with a Pressure Class Higher Than 1-Inch wg: Test representative duct sections totaling no less than twenty-five percent (25%) of total installed duct area for each designated pressure class.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
6. Give seven (7) days advance notice for testing.

3.7 START UP

- A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing".

3.8 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:
- B. Exhaust Ducts:
 1. All ducts that make up the exhaust system in its entirety.
 - a. Pressure Class: Positive or negative 2-inch wg.
- C. Elbow Configuration:
 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Manual volume dampers.
 - 2. Fire dampers.
 - 3. Smoke dampers.
 - 4. Flange connectors.
 - 5. Turning vanes.
 - 6. Duct-mounted access doors.
 - 7. Flexible connectors.
 - 8. Flexible ducts.
 - 9. 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.
 - c. Fire-damper, smoke dampers, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fusible Links: Furnish quantity equal to ten percent (10%) of amount installed.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- C. Comply with AMCA 500-D testing for damper rating.

2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653.
 - 1. Galvanized Coating Designation: G90.
 - 2. Exposed-Surface Finish: Mill phosphatized.
- B. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, one (1) side bright finish for exposed ducts.
- C. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.
- D. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- E. Tie Rods: Galvanized steel, ¼-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. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Greenheck
 - b. METALAIRE, Inc.
 - c. Ruskin Company
 - 2. Standard leakage rating, with linkage outside airstream.
 - 3. Suitable for horizontal or vertical applications.
 - 4. Frames:
 - a. Hat-shaped, galvanized steel channels, 0.064-inch minimum thickness.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 - 5. Blades:

- a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized steel, 0.064-inch-thick.
6. Blade Axles: Galvanized steel.
 7. Bearings:
 - a. Molded synthetic.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 8. Tie Bars and Brackets: Galvanized steel.
- B. Low-Leakage, Steel, Manual Volume Dampers:
1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Greenheck
 - b. METALAIRE, Inc.
 - c. Ruskin Company
 2. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
 3. Suitable for horizontal or vertical applications.
 4. Frames:
 - a. Angle shaped.
 - b. Galvanized steel channels, 0.064-inch-thick.
 - c. Mitered and welded corners.
 - d. Flanges for attaching to walls and flangeless frames for installing in ducts.
 5. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized, roll-formed steel, 0.064-inch-thick.
 6. Blade Axles: Galvanized steel.
 7. Bearings:
 - a. Molded synthetic.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 8. Blade Seals: Neoprene.
 9. Jamb Seals: Cambered stainless-steel.
 10. Tie Bars and Brackets: Galvanized steel.
 11. Accessories:

- a. Include locking device to hold single-blade dampers in a fixed position without vibration.
 - C. Jackshaft:
 - 1. Size: 1-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.
 - D. 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 FIRE DAMPERS
- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1. Greenheck
 - 2. METALAIRE, Inc.
 - 3. Ruskin Company
 - B. Type: Static; rated and labeled according to UL 555 by an NRTL.
 - C. Fire Rating: 1½ hours.
 - D. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch-thick galvanized steel; with mitered and interlocking corners.
 - E. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
 - 1. Minimum Thickness: 0.052- or 0.138-inch-thick, as indicated, and of length to suit application.
 - 2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
 - F. Mounting Orientation: Vertical or horizontal as indicated.
 - G. Blades: Roll-formed, interlocking, 0.034-inch-thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch-thick, galvanized-steel blade connectors.
 - H. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
 - I. Heat-Responsive Device: Replaceable, 165 deg F (74 deg C) rated, fusible links.

2.5 SMOKE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1. Nailor
 - 2. Prefco-HVAC
 - 3. Ruskin
- B. General Requirements: Label according to UL 555S by an NRTL.
- C. Smoke Detector: Integral, factory wired for single-point connection.
- D. Frame: Hat-shaped, galvanized sheet steel, with welded corners and mounting flange; gauge in accordance with UL listing.
- E. Blades: Roll-formed, horizontal, interlocking, galvanized sheet steel; gauge in accordance with UL listing.
- F. Leakage: Class I.
- G. Rated pressure and velocity to exceed design airflow conditions.
- H. Mounting Sleeve: Factory-installed, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone caulking; gauge in accordance with UL listing.
- I. Damper Motors: Modulating or two-position action.
- J. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 - 2. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
 - 3. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.
 - 4. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
 - 5. Non-Spring-Return Motors: For dampers larger than 25 sq. ft size motor for running torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.
 - 6. Electrical Connection: 115 V, single phase, 60 Hz.
- K. Accessories:
 - 1. Auxiliary switches for signaling.
 - 2. Test and reset switches, damper mounted.

2.6 FLANGE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1. Ductmate Industries, Inc.
 - 2. Nexus PDQ; Division of Shilco Holdings Inc.
 - 3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Description: Roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- C. Material: Galvanized steel.
- D. Gage and Shape: Match connecting ductwork.

2.7 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1. Ductmate Industries, Inc.
 - 2. Duro Dyne Inc.
 - 3. METALAIRE, Inc.
 - 4. SEMCO Incorporated
- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
 - 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards – Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."
- E. Vane Construction: Single wall for ducts up to 12 inches wide and double wall for larger dimensions.

2.8 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1. Ductmate Industries. Inc.
 - 2. METALAIRE, Inc.
 - 3. Ruskin Company

- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels – Round Duct."
1. Door:
 - a. Double wall, rectangular.
 - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
 - c. Vision panel.
 - d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
 - e. Fabricate doors airtight and suitable for duct pressure class.
 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 3. Number of Hinges and Locks:
 - a. Access Doors Less Than 12 Inches Square: No hinges and two (2) sash locks.
 - b. Access Doors up to 18 Inches Square: Two (2) hinges and two (2) sash locks.
 - c. Access Doors up to 24 by 48 Inches: Three (3) hinges and two (2) compression latches with outside and inside handles.
 - d. Access Doors Larger Than 24 by 48 Inches: Four (4) hinges and two (2) compression latches with outside and inside handles.
- C. Pressure Relief Access Door:
1. Door and Frame Material: Galvanized sheet steel.
 2. Door: Double wall with insulation fill with metal thickness applicable for duct pressure class.
 3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
 4. Doors close when pressures are within set-point range.
 5. Hinge: Continuous piano.
 6. Latches: Cam.
 7. Seal: Neoprene or foam rubber.
 8. Insulation Fill: 1-inch-thick, fibrous-glass or polystyrene-foam board.

2.9 DUCT ACCESS PANEL ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
1. 3M
 2. Ductmate Industries, Inc.
 3. Flame Gard, Inc.
- B. Labeled according to UL 1978 by an NRTL.
- C. Panel and Frame: Minimum thickness 0.0528-inch carbon steel.
- D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.

- E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F (1093 deg C).
- F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.10 INSULATED FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1. Ductmate Industries, Inc.
 - 2. Duro Dyne Inc.
 - 3. Ventfabrics, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3½ inches wide attached to 2 strips of 2¾-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd.
 - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 - 3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

2.11 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1. Flexmaster U.S.A., Inc.
 - 2. McGill AirFlow LLC
 - 3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Insulated, Flexible Duct: UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.
 - 1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 - 2. Maximum Air Velocity: 4000 fpm.
 - 3. Temperature Range: Minus 20 to plus 210 deg F (Minus 29 to plus 99 deg C).
 - 4. Installed Insulation value: R-5.
- C. Flexible Duct Connectors:
 - 1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

2.12 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards – Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install control 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 exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
 - 2. Install aluminum volume dampers in aluminum ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire and smoke dampers according to UL listing.
- H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - 1. On both sides of duct coils.
 - 2. Upstream from duct filters.
 - 3. At outdoor-air intakes and mixed-air plenums.
 - 4. At drain pans and seals.
 - 5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
 - 6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.

7. At each change in direction and at maximum 50-foot spacing.
 8. Upstream and downstream from turning vanes.
 9. Upstream or downstream from duct silencers.
 10. Control devices requiring inspection.
 11. Elsewhere as indicated.
- I. Install access doors with swing against duct static pressure.
- J. Access Door Sizes:
1. One-Hand or Inspection Access: 8 by 5 inches.
 2. Two-Hand Access: 12 by 6 inches.
 3. Head and Hand Access: 18 by 10 inches.
 4. Head and Shoulders Access: 21 by 14 inches.
 5. Body Access: 25 by 14 inches.
 6. Body plus Ladder Access: 25 by 17 inches.
- K. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- L. Install flexible connectors to connect ducts to equipment.
- M. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- N. Connect terminal units to supply ducts with maximum 60-inch lengths of flexible duct. Do not use flexible ducts to change directions.
- O. Connect diffusers or light troffer boots to ducts with maximum 60-inch lengths of flexible duct clamped or strapped in place.
- P. Connect flexible ducts to metal ducts with liquid adhesive plus tape.
- Q. Install duct test holes where required for testing and balancing purposes.
- R. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of ¼-inch movement during start and stop of fans.
- 3.2 FIELD QUALITY CONTROL
- A. Tests and Inspections:
1. Operate dampers to verify full range of movement.
 2. Inspect locations of access doors and verify that purpose of access door can be performed.
 3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
 4. Inspect turning vanes for proper and secure installation.
 5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 233300

SECTION 233423 - POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Centrifugal roof ventilators.
 - 2. Ceiling mounted ventilators.

1.3 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base fan-performance ratings on sea level.
- B. Operating Limits: Classify according to AMCA 99.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:
 - 1. Certified fan performance curves with system operating conditions indicated.
 - 2. Certified fan sound-power ratings.
 - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 - 4. Material thickness and finishes, including color charts.
 - 5. Dampers, including housings, linkages, and operators.
 - 6. Roof curbs.
 - 7. Fan speed controllers.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: For power, signal, and control wiring.
- C. Delegated-Design Submittal: For unit hangars and supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

2. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For power ventilators 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. Belts: Two (2) sets for each belt-driven unit.

1.8 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.
- C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

1.9 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 1. ACME Engineering
 2. Greenheck Fan Corporation
 3. Loren Cook Fan Company
- B. Housing: Removable, spun-aluminum, dome top and outlet baffle, square, one-piece, aluminum base with venturi inlet cone.

1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains and grease collector.
2. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.

C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

D. Belt Drives:

1. Resiliently mounted to housing.
2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
5. Fan and motor isolated from exhaust airstream.

E. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from one hundred (100) to less than fifty percent (50%) as indicated on schedule.
2. Disconnect Switch: Non-fusible type, with thermal-overload protection mounted outside fan housing, factory wired through an internal aluminum conduit.
3. Bird Screens: Removable, ½-inch mesh, aluminum or brass wire.
4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
5. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.

F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-inch thick, rigid, fiberglass insulation, 3 lb density, adhered to inside walls; and 2-inch wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Self-flashing without a cant strip, with mounting flange
2. Overall Height: 16 inches.

2.2 CEILING-MOUNTED VENTILATORS

A. Manufacturers:

1. Broan
2. Loren Cook
3. Panasonic

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille: plastic, louvered grille with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Accessories:

1. Isolation: Rubber-in-shear vibration isolators.
2. Manufacturer's standard roof jack or wall cap, and transition fittings.

G. Capacities and Characteristics:

1. Airflow: Refer to Schedule on Drawings.
2. External Static Pressure: Refer to Schedule on Drawings.
3. Sound: Refer to Schedule on Drawings.
4. Motor Size: Refer to Schedule on Drawings.
5. Motor rpm: Refer to Schedule on Drawings.

H. Electrical Characteristics:

1. Volts: Refer to Schedule on Drawings.
2. Phase: Refer to Schedule on Drawings.
3. Hertz: Refer to Schedule on Drawings.

2.3 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment".

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

- B. Enclosure Type: Totally enclosed, fan cooled.

2.4 SOURCE QUALITY CONTROL

- A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

- B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install power ventilators level and plumb.

- B. Equipment Mounting:

1. Comply with requirements for vibration isolation devices specified in Section 230548 “Vibration Controls for HVAC”.
 - C. Secure roof-mounted fans to roof curbs with cadmium-plated hardware.
 - D. Install units with clearances for service and maintenance.
 - E. Label units according to requirements specified in Section 230553 “Identification for HVAC Piping and Equipment”.
- 3.2 FIELD QUALITY CONTROL
- A. Perform tests and inspections.
 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
 - B. Tests and Inspections:
 1. Verify that shipping, blocking, and bracing are removed.
 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 3. Verify that cleaning and adjusting are complete.
 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
 5. Adjust belt tension.
 6. Adjust damper linkages for proper damper operation.
 7. Verify lubrication for bearings and other moving parts.
 8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
 9. Disable automatic temperature-control operators, energize motor, and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
 10. Shut unit down and reconnect automatic temperature-control operators.
 11. Remove and replace malfunctioning units and retest as specified above.
 - C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - D. Prepare test and inspection reports.
- 3.3 ADJUSTING
- A. Adjust damper linkages for proper damper operation.
 - B. Adjust belt tension.
 - C. Comply with requirements in Section 230593 “Testing, Adjusting, and Balancing” for testing, adjusting, and balancing procedures.

- D. Replace fan and motor pulleys as required to achieve design airflow.
- E. Lubricate bearings.

END OF SECTION 233423

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Rectangular and square ceiling inlets and outlets.

B. Related Sections:

- 1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

- 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
- 2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.

C. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.

1.4 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.

PART 2 - PRODUCTS

2.1 CEILING INLETS AND OUTLETS

A. Rectangular and Square Ceiling Inlets and Outlets:

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Kruger
 - b. Price Industries
 - c. Titus
2. Characteristics and Performance:
 - a. Refer to Schedules on Drawings.

2.2 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where inlets and outlets are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install inlets and outlets 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 practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install inlets and outlets with airtight connections to ducts and to allow service and maintenance of dampers and fire dampers.

END OF SECTION 233713

SECTION 238233 - CONVECTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes hydronic convectors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- 1. Include rated capacities, operating characteristics, furnished specialties, and accessories.

- B. Shop Drawings:

- 1. Include plans, elevations, sections, and details.
- 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- 3. Include details and dimensions of custom-fabricated enclosures.
- 4. Indicate location and size of each field connection.
- 5. Indicate location and arrangement of piping valves and specialties.
- 6. Indicate location and arrangement of integral controls.
- 7. Include enclosure joints, corner pieces, access doors, and other accessories.
- 8. Include diagrams for power, signal, and control wiring.

- C. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

- 1. Structural members, including wall construction, to which convectors will be attached.
- 2. Method of attaching convectors to building structure.
- 3. Penetrations of fire-rated wall and floor assemblies.

- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 HOT-WATER CONVECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
1. Modine
 2. Rittling
 3. Sterling
- B. Heating Elements: Seamless copper tubing mechanically expanded into evenly spaced aluminum fins and rolled into cast-iron or brass headers with inlet/outlet and air vent; steel side plates and supports. Factory-pressure-test element at minimum 100 psig.
1. Element Height: See Schedule on Drawings.
 2. Element Depth: See Schedule on Drawings.
 3. Element Length: See Schedule on Drawings.
 4. Entering-Air Temperature: See Schedule on Drawings.
 5. Heat Output: See Schedule on Drawings.
 6. Entering Water Temperature: 180 deg F.
 7. Leaving Water Temperature: See Schedule on Drawings.
 8. Pressure Loss: See Schedule on Drawings.
- C. Front and Top Panel: Minimum 14-gauge steel with exposed corners rounded; removable front panels with tamper-resistant fasteners braced and reinforced for stiffness.
- D. Wall-Mounted Back and End Panels: Minimum 0.0428-inch-thick steel.
- E. Floor-Mounted Pedestals: Conceal conduit for power and control wiring at maximum 36-inch spacing. Pedestal-mounted back panel shall be solid panel matching front panel.
- F. Support Brackets: Locate at maximum 36-inch spacing to support front panel and element.
- G. Insulation: ½-inch-thick, fibrous glass on inside of the back of the enclosure.
- H. Finish: Baked-enamel finish in color as selected by Architect and Owner from manufacturer's entire range.
- I. Damper: Knob-operated internal damper.
- J. Access Doors: Factory made, permanently hinged with tamper-resistant fastener, minimum size 6 by 7 inches, integral with enclosure.
- K. Enclosure Style: Freestanding unit with slope top and partially recessed wall unit.
1. Front Inlet and Outlet Grille: Punched louver; painted to match enclosure.
 2. Enclosure Height, Depth and Length: See Schedule on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive convectors for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for hydronic-piping connections to verify actual locations before installation of convector.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install convectors level and plumb.
- B. Install valves within reach of access door provided in enclosure.
- C. Install air-seal gasket between wall and recessed flanges or front cover of fully recessed unit.
- D. Install piping within pedestals for freestanding units.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in Section 232113 "Hydronic Piping". Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect hot-water convectors and components to piping according to Section 232113 "Hydronic Piping".
 - 1. Install shutoff valves on inlet and outlet, and balancing valve on outlet.

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start convectors to confirm proper operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Convectors will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 238233

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

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. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Grout.
5. Common electrical installation requirements.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Product Data: For sleeve seals.

1.5 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel.
 - 1. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052-inch.
 - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and one (1) or more sides equal to, or more than, 16 inches, thickness shall be 0.138-inch.

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one (1) of the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
 - 2. Sealing Elements: EPDM and/or NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - 3. Pressure Plates: Plastic, carbon steel or stainless-steel. Include two (2) for each sealing element.
 - 4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating or stainless-steel of length required to secure pressure plates to sealing elements. Include one (1) for each sealing element.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- 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. Cut sleeves to length for mounting flush with both surfaces of walls.
- E. Size pipe sleeves to provide ½-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- F. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- G. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."

3.3 SLEEVE-SEAL INSTALLATION

- A. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION 260500

SECTION 260509 - ELECTRICAL DEMOLITION REQUIREMENTS

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. Demolition involving electrical system as described in Contract Documents.

B. Related Sections:

- 1. Section 260500 "Common Work Results for Electrical"
- 2. New and replacement work specified in appropriate specification sections.

1.3 SCHEDULING

- A. Include on Construction Schedule sequence of individual electrical demolition operations.
- B. Coordinate with Owner for equipment and materials to be removed by Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. All relocations, reconnections and removals are not necessarily indicated on Drawings. All such work shall be included without additional cost to Owner.

3.2 PREPARATION

- A. Disconnect equipment that is to be removed or relocated. Carefully remove, disassemble, or dismantle as required, and store in approved location on site, existing items to be reused in completed work.
- B. Where affected by demolition or new construction, relocate, extend, or repair raceways, conductors, outlets, and apparatus to allow continued use of electrical system. Use methods and materials as specified for new construction.

3.3 PERFORMANCE

- A. Perform drilling, cutting, block-offs and demolition work required for removal of necessary portions of electrical system. Do not cut joists, beams, girders, trusses, or columns without prior written permission from Architect.
- B. Remove concealed wiring abandoned due to demolition or new construction. Remove circuits, conduits and conductors that are not to be re-used back to next active fixture, device, or junction box.
- C. Patch, repair, and finish surfaces affected by electrical demolition work, unless work is specifically called for under other Sections of the specifications.

3.4 CLEANING

- A. Remove obsolete raceways, conductors, apparatus, and lighting fixtures promptly from site and dispose of legally.

END OF SECTION 260509

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. This Section includes the following:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.
 - 3. Sleeves and sleeve seals for cables.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.
- C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
 - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1. Alcan Products Corporation; Alcan Cable Division
 - 2. American Insulated Wire Corp.; a Leviton Company
 - 3. General Cable Corporation
 - 4. Senator Wire & Cable Company
 - 5. Southwire Company
 - 6. Belden
- B. Aluminum and Copper Conductors: Comply with NEMA WC 70.
- C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.
- D. Multiconductor Cable: Comply with NEMA WC 70 for armored cable, Type AC, metal-clad cable, Type MC, mineral-insulated, and metal-sheathed cable, Type MI with ground wire.

2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Hubbell Power Systems, Inc.
 - 3. O-Z/Gedney; EGS Electrical Group LLC
 - 4. 3M; Electrical Products Division
 - 5. Tyco Electronics Corp.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SLEEVES FOR CABLES

- A. Comply with requirements in Section 260500 “Common Work Results for Electrical” for sleeves for cables.

2.4 SLEEVE SEALS

- A. Comply with requirements in Section 260500 “Common Work Results for Electrical” for sleeve seals.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- B. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway and metal-clad cable, Type MC.
- C. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- D. Class 2 Control Circuits: Type THHN-THWN, in raceway Power-limited cable, concealed in building finishes, Power-limited tray cable, in cable tray.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. 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.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.
- E. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Comply with requirements in Section 260500 “Common Work Results for Electrical” for installation of sleeves.

3.6 SLEEVE-SEAL INSTALLATION

- A. Comply with requirements in Section 260500 “Common Work Results for Electrical” for installation sleeve seals.

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test conductors feeding the following critical equipment and services for compliance with requirements.
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- C. 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.
- D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER 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. UTP cabling.
 - 2. RS-232 cabling.
 - 3. RS-485 cabling.
 - 4. Low-voltage control cabling.
 - 5. Control-circuit conductors.
 - 6. Identification products.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. IDC: Insulation displacement connector.
- C. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.
- D. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).
- E. RCDD: Registered Communications Distribution Designer.
- F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.
- C. Source quality-control reports.
- D. Field quality-control reports.
- E. Maintenance Data: For wire and cable to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of an NRTL.
 - 1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 50 or less.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
 - 1. Test each pair of UTP cable for open and short circuits.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install UTP 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.

PART 2 - PRODUCTS

2.1 PATHWAYS

- A. Support of Open Cabling: NRTL labeled for support of Category 5e and Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
 - 1. Support brackets with cable tie slots for fastening cable ties to brackets.
 - 2. Lacing bars, spools, J-hooks, and D-rings.
 - 3. Straps and other devices.
- B. Conduit and Boxes: Comply with requirements in Section 260533 "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.
 - 1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2½ inches deep.

2.2 UTP CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Berk-Tek; a Nexans company
 2. CommScope, Inc.
 3. Mohawk; a division of Belden CDT
 4. Superior Essex Inc.
- B. Description: 100-ohm, 4-pair UTP, formed into 25-pair, binder groups covered with a blue thermoplastic jacket.
1. Comply with ICEA S-90-661 for mechanical properties.
 2. Comply with TIA/EIA-568-B.1 for performance specifications.
 3. Comply with TIA/EIA-568-B.2, Category 6.
 4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
 - a. Communications, Plenum Rated: Type CMP complying with UL 1685.
 - b. Communications, Riser Rated: Type CMP or Type CMR in metallic conduit installed per NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."

2.3 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
1. Hubbell Premise Wiring
 2. Orthotronics
 3. Leviton Voice & Data Division
 4. Panduit Corp.
- B. UTP Cable Connecting Hardware: IDC type, using modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of the same category or higher.
- C. Connecting Blocks: 110 style for Category 5e and 110 style for Category 6. Provide blocks for the number of cables terminated on the block, plus twenty-five percent (25%) spare; integral with connector bodies, including plugs and jacks where indicated.

2.4 RS-232 CABLE

- A. Plenum-Rated Cable: NFPA 70, Type CMP.
1. Paired, two (2) pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
 2. Plastic insulation.
 3. Individual aluminum foil-polyester tape shielded pairs with one hundred percent (100%) shield coverage.
 4. Plastic jacket.
 5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned-copper drain wire.
 6. Flame Resistance: Comply with NFPA 262.

2.5 RS-485 CABLE

- A. Plenum-Rated Cable: NFPA 70, Type CMP.
 - 1. Paired, two (2) pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
 - 2. Fluorinated ethylene propylene insulation.
 - 3. Unshielded.
 - 4. Fluorinated ethylene propylene jacket.
 - 5. Flame Resistance: NFPA 262, Flame Test.

2.6 LOW-VOLTAGE CONTROL CABLE

- A. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
 - 1. One (1) pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
 - 2. PVC insulation.
 - 3. Unshielded.
 - 4. PVC jacket.
 - 5. Flame Resistance: Comply with NFPA 262.

2.7 CONTROL-CIRCUIT CONDUCTORS

- A. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, Type XHHN, in raceway, complying with UL 83 and/or UL 44.
- B. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, in raceway, Type XHHN, in raceway, power-limited cable, concealed in building finishes, power-limited tray cable, in cable tray, complying with UL 83 and/or UL 44.
- C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or Type TF, complying with UL 83.

2.8 IDENTIFICATION PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1. Brady Corporation
 - 2. HellermannTyton
 - 3. Kroy LLC
 - 4. Panduit Corp.
- B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- C. Comply with requirements in Section 260553 "Identification for Electrical Systems."

2.9 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test UTP cables on reels according to TIA/EIA-568-B.1.

- C. Factory test UTP cables according to TIA/EIA-568-B.2.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 INSTALLATION OF PATHWAYS

- A. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.
- B. Comply with requirements in Section 260533 "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.
- C. Install manufactured conduit sweeps and long-radius elbows if possible.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
 - 1. Comply with TIA/EIA-568-B.1.
 - 2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
 - 3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect 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. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
 - 6. 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.
 - 7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
 - 8. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
- C. UTP Cable Installation:
 - 1. Comply with TIA/EIA-568-B.2.
 - 2. Install 110-style IDC termination hardware unless otherwise indicated.
 - 3. Do not untwist UTP cables more than ½-inch from the point of termination to maintain cable geometry.
- D. Installation of Control-Circuit Conductors:

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1. Install wiring in raceways. Comply with requirements specified in Section 260533 "Raceway and Boxes for Electrical Systems."

E. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

F. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2½ inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.3 REMOVAL OF CONDUCTORS AND CABLES

- A. Remove abandoned conductors and cables.

3.4 CONTROL-CIRCUIT CONDUCTORS

- A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits, No 14 AWG.
2. Class 2 low-energy, remote-control, and signal circuits, No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm, and signal circuits, No 12 AWG.

3.5 GROUNDING

- A. For data communication wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. For low-voltage wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.6 IDENTIFICATION

- A. Identify system components, wiring, and cabling according to TIA/EIA-606-A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.7 FIELD QUALITY CONTROL

- A. Perform Tests and Inspections:
 1. Visually inspect UTP cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments and inspect cabling connections to confirm compliance with TIA/EIA-568-B.1.
 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 3. Test UTP 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 after cross connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
- B. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide or transfer the data from the instrument to the computer, save as text files, print, and submit.
- C. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 260523

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 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For qualified testing agency and testing agency's field supervisor.
- C. Field quality-control reports.
- D. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals items specified in Section 017823 "Operation and Maintenance Data."

1.3 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, ¼-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.

2.2 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. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two (2) bolts.
- C. 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. Conductor Terminations and Connections:
 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 2. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. 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. Flexible raceway runs.
 6. Armored and metal-clad cable runs.

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. 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.

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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.
- C. 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.

3.4 LABELING

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems" Article for instruction signs. The label or its text shall be green.

3.5 FIELD QUALITY CONTROL

- A. Perform 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.
- B. Grounding system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.
- D. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm.
- E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Hangers and supports for electrical equipment and systems.

- B. Related Sections include the following:

- 1. Section 260548 "Vibration and Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.

- B. IMC: Intermediate metal conduit.

- C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five (5) times the applied force.

1.5 SUBMITTALS

- A. Product Data: For the following:

- 1. Steel slotted support systems.
 - 2. Nonmetallic slotted support systems.

- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers. Include Product Data for components.
 - 2. Steel slotted channel systems. Include Product Data for components.
 - 3. Nonmetallic slotted channel systems. Include Product Data for components.
 - 4. Equipment supports.
- C. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA 4, factory-fabricated components for field assembly.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit
 - b. Cooper B-Line, Inc.; a division of Cooper Industries
 - c. ERICO International Corporation
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 5. Channel Dimensions: Selected for applicable load criteria.
- B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch-diameter holes at a maximum of 8 inches o.c., in at least one (1) surface.

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit
 - b. Cooper B-Line, Inc.; a division of Cooper Industries
 - c. Fabco Plastics Wholesale Limited
 - d. Seasafe, Inc.
 2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
 3. Fitting and Accessory Materials: Same as channels and angles, except metal items may be stainless-steel.
 4. Rated Strength: Selected to suit applicable load criteria.
- C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated and stainless-steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC
 2. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 3. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 4. Toggle Bolts: All-steel springhead type.
 5. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be ¼-inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least twenty-five percent (25%) in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps single-bolt conduit clamps single-bolt conduit clamps using spring friction action for retention in support channel.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1½-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 3. To Existing Concrete: Expansion anchor fasteners.
 - 4. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 - 5. To Steel: Welded threaded studs complying with AWS D1.1, with lock washers and nuts, Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69, Spring-tension clamps.

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6. To Light Steel: Sheet metal screws.
 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.
- 3.3 PAINTING
- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAY 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. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. EPDM: Ethylene-propylene-diene terpolymer rubber.
- D. FMC: Flexible metal conduit.
- E. IMC: Intermediate metal conduit.
- F. LFMC: Liquidtight flexible metal conduit.
- G. LFNC: Liquidtight flexible nonmetallic conduit.
- H. NBR: Acrylonitrile-butadiene rubber.
- I. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Structural members in the paths of conduit groups with common supports.
 - 2. HVAC and plumbing items and architectural features in the paths of conduit groups with common supports.
- C. Manufacturer Seismic Qualification Certification: Submit certification that enclosures and cabinets and their mounting provisions, including those for internal components, will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." Include the following:

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1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the cabinet or enclosure will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will retain its enclosure characteristics, including its interior accessibility, after the seismic event."
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Qualification Data: For professional engineer and testing agency.

E. Source quality-control test reports.

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.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 1. AFC Cable Systems, Inc.
 2. Alflex Inc.
 3. Allied Tube & Conduit; a Tyco International Ltd. Co.
 4. Anamet Electrical, Inc.; Anaconda Metal Hose
 5. Electri-Flex Co.
 6. Manhattan/CDT/Cole-Flex
 7. Maverick Tube Corporation
 8. O-Z Gedney; a unit of General Signal
 9. Wheatland Tube Company
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Aluminum Rigid Conduit: ANSI C80.5.
- D. IMC: ANSI C80.6.
- E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit and IMC.
 1. Comply with NEMA RN 1.

- 2. Coating Thickness: 0.040-inch, minimum.
- F. EMT: ANSI C80.3.
- G. FMC: Zinc-coated steel or aluminum.
- H. LFMC: Flexible steel conduit with PVC jacket.
- I. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
 - 2. Fittings for EMT: Steel or die-cast and set-screw or compression type.
 - 3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040-inch, with overlapping sleeves protecting threaded joints.
- J. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Anamet Electrical, Inc.; Anaconda Metal Hose
 - 3. Aruco Corporation
 - 4. CANTEX Inc.
 - 5. CertainTeed Corp.; Pipe & Plastics Group
 - 6. Condux International, Inc.
 - 7. ElecSYS, Inc.
 - 8. Electri-Flex Co.
 - 9. Lamson & Sessions; Carlon Electrical Products
 - 10. Manhattan/CDT/Cole-Flex
 - 11. RACO; a Hubbell Company
 - 12. Thomas & Betts Corporation
- B. ENT: NEMA TC 13.
- C. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.
- D. LFNC: UL 1660.
- E. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.
- F. Fittings for LFNC: UL 514B.

2.3 METAL WIREWAYS

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1. Cooper B-Line, Inc.
 - 2. Hoffman
 - 3. Square D; Schneider Electric
- B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 3R, unless otherwise indicated.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Hinged type, Screw-cover type, Flanged-and-gasketed type, or as indicated.
- E. Finish: Manufacturer's standard enamel finish.

2.4 NONMETALLIC WIREWAYS

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1. Hoffman
 - 2. Lamson & Sessions; Carlon Electrical Products
- B. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.5 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Architect and Owner from entire range.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Thomas & Betts Corporation
 - b. Walker Systems, Inc.; Wiremold Company (The)
 - c. Wiremold Company (The); Electrical Sales Division
- B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Architect and Owner from manufacturer's entire range.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Butler Manufacturing Company; Walker Division
 - b. Enduro Systems, Inc.; Composite Products Division
 - c. Hubbell Incorporated; Wiring Device-Kellems Division
 - d. Lamson & Sessions; Carlon Electrical Products
 - e. Panduit Corp.
 - f. Walker Systems, Inc.; Wiremold Company (The)
 - g. Wiremold Company (The); Electrical Sales Division

2.6 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 2. EGS/Appleton Electric
 3. Erickson Electrical Equipment Company
 4. Hoffman
 5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division
 6. O-Z/Gedney; a unit of General Signal
 7. RACO; a Hubbell Company
 8. Robroy Industries, Inc.; Enclosure Division
 9. Scott Fetzer Co.; Adalet Division
 10. Spring City Electrical Manufacturing Company
 11. Thomas & Betts Corporation
 12. Walker Systems, Inc.; Wiremold Company (The)
 13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, cast ferrous alloy, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- F. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized cast iron with gasketed cover.
- G. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.

2.7 SLEEVES FOR RACEWAYS

- A. Comply with requirements in Section 260500 “Common Work Results for Electrical” for sleeves for raceways.

2.8 SLEEVE SEALS

- A. Comply with requirements in Section 260500 “Common Work Results for Electrical” for sleeve seals.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Comply with the following indoor applications, unless otherwise indicated:
 - 1. Exposed, Not Subject to Physical Damage: EMT, ENT, or RNC.
 - 2. Exposed, Not Subject to Severe Physical Damage: EMT, RNC identified for such use.
 - 3. Concealed in Ceilings and Interior Walls and Partitions: EMT, ENT, or RNC, Type EPC-40-PVC.
 - 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: Rigid steel conduit.
 - 6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel nonmetallic in damp or wet locations.
- B. Minimum Raceway Size: ¾-inch trade size.
- C. 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.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.
- D. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- E. Do not install aluminum conduits in contact with concrete.

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.

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Section 260529 "Hangers and Supports for Electrical Systems."
- E. Install no more than the equivalent of four (4) 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- F. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- G. 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.
- H. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- I. 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.
- J. 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.
- K. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run length that exceeds 25 feet.
 - 1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
 - c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
 - d. Attics: 135 deg F (75 deg C) temperature change.
 - 2. Install fitting(s) that provide expansion and contraction for at least 0.00041-inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change.
 - 3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

- L. Flexible Conduit Connections: Use 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 subject to severe physical damage.
 - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- M. 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. Comply with requirements in Section 260500 “Common Work Results for Electrical” for installation of sleeves.

3.4 SLEEVE-SEAL INSTALLATION

- A. Comply with requirements in Section 260500 “Common Work Results for Electrical” for installation sleeve seals.

3.5 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260548 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Isolation pads.
- 2. Spring isolators.
- 3. Restrained spring isolators.
- 4. Channel support systems.
- 5. Restraint cables.
- 6. Hanger rod stiffeners.
- 7. Anchorage bushings and washers.

- B. Related Sections include the following:

- 1. Section 260529 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.3 DEFINITIONS

- A. The IBC: International Building Code.

- B. ICC-ES: ICC-Evaluation Service.

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic-Restraint Loading:

- 1. Site Class as Defined in the IBC: E.
- 2. Assigned Seismic Use Group or Building Category as Defined in the IBC: III.
 - a. Component Importance Factor: 1.5.
 - b. Component Response Modification Factor: 5.0.
 - c. Component Amplification Factor: 1.0.
- 3. Design Spectral Response Acceleration at Short Periods (0.2 Second).

1.5 ACTION SUBMITTALS

- A. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
 2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
 - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
 - b. Annotate to indicate application of each product submitted and compliance with requirements.
 3. Restrained-Isolation Devices: Include ratings for horizontal, vertical, and combined loads.
- B. Delegated-Design Submittal: For vibration isolation and seismic-restraint details 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. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators and seismic restraints.
 2. Indicate materials and dimensions and identify hardware, including attachment and anchorage devices.
 3. Field-fabricated supports.
 4. Seismic-Restraint Details:
 - a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
 - b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
 - c. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints.
- B. Qualification Data: For professional engineer and testing agency.
- C. Welding certificates.
- D. Field quality-control test reports.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
- B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."
- D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.
- E. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1. Ace Mountings Co., Inc.
 - 2. Amber/Booth Company, Inc.
 - 3. California Dynamics Corporation
 - 4. Isolation Technology, Inc.
 - 5. Kinetics Noise Control
 - 6. Mason Industries
 - 7. Vibration Eliminator Co., Inc.
 - 8. Vibration Isolation
 - 9. Vibration Mountings & Controls, Inc.
- B. Pads: Arrange in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.
 - 1. Resilient Material: Oil- and water-resistant neoprene.
- C. Spring Isolators: Freestanding, laterally stable, open-spring isolators.
 - 1. Outside Spring Diameter: Not less than eighty percent (80%) of the compressed height of the spring at rated load.
 - 2. Minimum Additional Travel: Fifty percent (50%) of the required deflection at rated load.

3. Lateral Stiffness: More than eighty percent (80%) of rated vertical stiffness.
 4. Overload Capacity: Support two hundred percent (200%) of rated load, fully compressed, without deformation or failure.
 5. Baseplates: Factory drilled for bolting to structure and bonded to ¼-inch-thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig.
 6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.
- D. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.
1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to ¼-inch-thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
 2. Restraint: Seismic or limit-stop as required for equipment and authorities having jurisdiction.
 3. Outside Spring Diameter: Not less than eighty percent (80%) of the compressed height of the spring at rated load.
 4. Minimum Additional Travel: Fifty percent (50%) of the required deflection at rated load.
 5. Lateral Stiffness: More than eighty percent (80%) of rated vertical stiffness.
 6. Overload Capacity: Support two hundred percent (200%) of rated load, fully compressed, without deformation or failure.

2.2 SEISMIC-RESTRAINT DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
1. Amber/Booth Company, Inc.
 2. California Dynamics Corporation
 3. Cooper B-Line, Inc.; a division of Cooper Industries
 4. Hilti Inc.
 5. Loos & Co.; Seismic Earthquake Division
 6. Mason Industries
 7. TOLCO Incorporated; a brand of NIBCO INC.
 8. Unistrut; Tyco International, Ltd.
- B. General Requirements for Restraint Components: Rated strengths, features, and application requirements shall be as defined in reports by an agency acceptable to authorities having jurisdiction.
1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four (4) times the maximum seismic forces to which they will be subjected.
- C. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

- D. Restraint Cables: ASTM A 603 galvanized-steel cables with end connections made of steel assemblies with thimbles, brackets, swivels, and bolts designed for restraining cable service; and with a minimum of two (2) clamping bolts for cable engagement.
- E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod. Do not weld stiffeners to rods.
- F. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices.
- G. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
- H. Mechanical Anchor: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless-steel for exterior applications. Select anchors with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight (8) times diameter.
- I. Adhesive Anchor: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless-steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.3 FACTORY FINISHES

- A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.
 - 1. Powder coating on springs and housings.
 - 2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
 - 3. Baked enamel or powder coat for metal components on isolators for interior use.
 - 4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Equipment and Hanger Restraints:
 - 1. Install restrained isolators on electrical equipment.
 - 2. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125-inch.
 - 3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.
- B. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- C. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- D. Drilled-in Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
 - 5. Set anchors to manufacturer's recommended torque, using a torque wrench.
 - 6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.5 FIELD QUALITY CONTROL

A. Perform Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven (7) days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four (4) of each type and size of installed anchors and fasteners selected by Architect.
5. Test to ninety percent (90%) of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.
9. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

- B. Remove and replace malfunctioning units and retest as specified above.

- C. Prepare test and inspection reports.

3.6 ADJUSTING

- A. Adjust isolators after isolated equipment is at operating weight.
- B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
- C. Adjust active height of spring isolators.
- D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 260548

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification of power and control cables.
 - 3. Identification for conductors.
 - 4. Equipment identification labels.
 - 5. Miscellaneous identification products.

1.3 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and IEEE C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.

- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage and system or service type.
- C. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- D. Metal Tags: Brass or aluminum, 2-by-2-by-0.05-inch, with stamped legend, punched for use with self-locking cable tie fastener.

2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Colors for Raceways Carrying Circuits at 600 V and Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage and system or service type.
- C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Metal Tags: Brass or aluminum, 2-by-2-by-0.05-inch, with stamped legend, punched for use with self-locking cable tie fastener.
- C. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

- B. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.5 EQUIPMENT IDENTIFICATION LABELS

- A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8-inch. Overlay shall provide a weatherproof and UV-resistant seal for label.
- B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8-inch.
- C. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8-inch.

2.6 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one-piece, self locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16-inch.
 - 2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 - 4. Color: Black except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one-piece, self-locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16-inch.
 - 2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 - 4. Color: Black.
- C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one-piece, self-locking.
 - 1. Minimum Width: 3/16-inch.
 - 2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 7000 psi.
 - 3. UL 94 Flame Rating: 94V-0.
 - 4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
 - 5. Color: Black.

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl label. Install labels at 30-foot maximum intervals.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Power.
- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:

- 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
- c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two (2) turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- D. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.
- E. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- F. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
 - a. Indoor Equipment: Adhesive film label. Unless otherwise indicated, provide a single line of text with ½-inch-high letters on 1½-inch-high label; where two (2) lines of text are required, use labels 2 inches high.
 - b. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - c. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
 2. Equipment to Be Labeled:
 - a. Enclosures and electrical cabinets.
 - b. Access doors and panels for concealed electrical items.
 - c. Enclosed switches.
 - d. Enclosed circuit breakers.
 - e. Variable-speed controllers.
 - f. Contactors.
 - g. Remote-controlled switches, dimmer modules, and control devices.

END OF SECTION 260553

SECTION 260923 - 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.

1.2 SUMMARY

- A. This Section includes the following lighting control devices:
 - 1. Indoor occupancy sensors.
- B. Related Sections include the following:
 - 1. Section 262726 "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.3 DEFINITIONS

- A. LED: Light-emitting diode.
- B. PIR: Passive infrared.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show installation details for occupancy and light-level sensors.
 - 1. Interconnection diagrams showing field-installed wiring.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 COORDINATION

- A. 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 system, and partition assemblies.

PART 2 - PRODUCTS**2.1 INDOOR OCCUPANCY SENSORS**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one (1) of the following:
1. Hubbell Lighting
 2. Leviton Mfg. Company Inc.
 3. Lithonia Lighting; Acuity Lighting Group, Inc.
 4. Novitas, Inc.
 5. RAB Lighting, Inc.
 6. Sensor Switch, Inc.
 7. TORK
 8. Watt Stopper (The)
- B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.
1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
 3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
 4. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a ½-inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
 6. Bypass Switch: Override the on function in case of sensor failure.
 7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; keep lighting off when selected lighting level is present.
- C. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on-off functions shall be selectable in the field by operating controls on unit.
1. Sensitivity Adjustment: Separate for each sensing technology.
 2. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.

3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.

2.2 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

- A. Install and aim sensors in locations to achieve not less than ninety percent (90%) coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 CONTACTOR INSTALLATION

- A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

- A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size shall be ½-inch.
- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
- D. 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 260553 "Identification for Electrical Systems."
 1. Identify controlled circuits in lighting contactors.

2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.

B. Label contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
2. Operational Test: Verify operation of each lighting control device and adjust time delays.

B. Lighting control devices that fail tests and inspections are defective work.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within twelve (12) months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit occupied conditions. Provide up to two (2) visits to Project during other-than-normal occupancy hours for this purpose.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices. Refer to Section 017900 "Demonstration and Training."

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. This Section includes the following:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Snap switches.
 - 3. Wall-switch.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. TVSS: Transient voltage surge suppressor.
- F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.
- C. Samples: One (1) for each type of device and wall plate specified, in each color specified.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one (1) source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one (1) source.

- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper)
 - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell)
 - 3. Leviton Mfg. Company Inc. (Leviton)
 - 4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour)

2.2 GFCI RECEPTACLES

- A. General Description: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; **GF20**
 - b. Pass & Seymour; **2084**

2.3 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; **2221** (single pole), **2222** (two-pole), **2223** (three-way), **2224** (four-way)
 - b. Hubbell; **CS1221** (single pole), **CS1222** (two-pole), **CS1223** (three-way), **CS1224** (four-way)
 - c. Leviton; **1221-2** (single pole), **1222-2** (two-pole), **1223-2** (three-way), **1224-2** (four-way)
 - d. Pass & Seymour; **20AC1** (single pole), **20AC2** (two-pole), **20AC3** (three-way), **20AC4** (four-way)
- C. Key-Operated Switches, 120/277 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; **2221L**
 - b. Hubbell; **HBL1221L**
 - c. Leviton; **1221-2L**
 - d. Pass & Seymour; **PS20AC1-L**
2. Description: Single pole, with factory-supplied key in lieu of switch handle.

2.4 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 1. Plate-Securing Screws: Stainless, tamper resistant with trident pan head matching current building standard.
 2. Material for Finished Spaces: Brushed stainless.
 3. Material for Unfinished Spaces: Brushed stainless for flush box installations, raised galvanized for surface box installations.
 4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover and listed and labeled for use in wet locations while in use.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, thermoplastic with lockable cover.

2.5 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
 1. Wiring Devices Connected to Normal Power System: Ivory and/or as selected by Architect and Owner, unless otherwise indicated or required by NFPA 70 or device listing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
 1. Take steps to ensure that devices and their boxes are protected. 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 the 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 just 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. Pigtailling existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they 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, $\frac{2}{3}$ to $\frac{3}{4}$ of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the 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.
10. Install GFCI devices in all wet locations.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. 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.

3.2 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

1. Receptacles and Switches: Identify panelboard and circuit number from which served. Use self-adhesive labels with black lettering on white field mounted on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of six percent (6%) or higher is not acceptable.
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. The 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, replace with new ones, and retest as specified above.

END OF SECTION 262726

SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Interior solid-state luminaires that use LED technology.
- 2. Lighting fixture supports.

B. Related Requirements:

- 1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

- 1. Arrange in order of luminaire designation.
- 2. Include data on features, accessories, and finishes.
- 3. Include physical description and dimensions of luminaires.
- 4. Include emergency lighting units, including batteries and chargers.
- 5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
- 6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture

type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project IES LM-79 and IES LM-80.

- a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Shop Drawings: For nonstandard or custom luminaires.
1. Include plans, elevations, sections, and mounting and attachment details.
 2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 3. Include diagrams for power, signal, and control wiring.
- C. Samples: For each luminaire housing supply at submittal stage, a paint chip of the fixture color as specified on the fixture schedule for approval.
- D. For Luminaires and Lamps (Refer to Product Schedule): Shipping carton/box designation to be clearly marked with same designations as indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Lighting luminaires.
 2. Suspended ceiling components.
 3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.
 4. Structural members to which equipment and or luminaires will be attached.
 5. Initial access modules for acoustical tile, including size and locations.
 6. Items penetrating finished ceiling, including the following:
 - a. Other luminaires.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 7. Moldings.
- B. Qualification Data: For testing laboratory providing photometric data for luminaires.
- C. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
- D. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
 - E. Product Certificates: For each type of luminaire.
 - F. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.
 - G. Sample warranty.
- 1.6 CLOSEOUT SUBMITTALS
- A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
 1. Provide a list of all lamp types used on Project; use ANSI and/or manufacturers' model numbers.
- 1.7 MAINTENANCE MATERIAL SUBMITTALS
- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Lamps (Arrays) + Driver(s): One (1) spare for every twenty-five (25) of each type and rating installed. Furnish at least one (1) of each type.
 2. Diffusers and Lenses: One (1) for every ten (10) of each type and rating installed. Furnish at least one (1) of each type.
 3. Globes and Guards: One (1) for every ten (10) of each type and rating installed. Furnish at least one (1) of each type.
- 1.8 QUALITY ASSURANCE
- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.
 - B. Provide luminaires from a single manufacturer for each luminaire type.
 - C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.
 - D. Mockups: For interior lighting luminaires in room or module mockups, complete with power and control connections.
 1. Obtain Architect's approval of luminaires in mockups before starting installations.
 2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.
 1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. Recessed Fixtures: Comply with NEMA LE 4.
- E. Bulb shape complying with ANSI C79.1.
- F. Lamp base complying with ANSI C81.61 (where applicable).
- G. CRI of minimum 80. CCT of 4000K.
- H. Rated lamp life of 50,000 hours.
- I. Lamps dimmable from one hundred percent to zero percent (100-0%) of maximum light output.

- J. Internal driver.
- K. Nominal Operating Voltage: 120-277 VAC.
 - 1. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.
- L. Housings:
 - 1. Extruded-aluminum or aluminum housing and heat sink.
 - 2. Finish approval by architect.
- M. Manufacturer – Basis-of-Design:
 - 1. See Fixture Schedule on Drawings.

2.3 MATERIALS

- A. Metal Parts:
 - 1. Free of burrs and sharp corners and edges.
 - 2. Sheet metal components shall be steel unless otherwise indicated.
 - 3. Form and support to prevent warping and sagging.
- B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- C. Diffusers and Globes:
 - 1. Acrylic Diffusers: One hundred percent (100%) virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - 2. Glass: Annealed crystal glass unless otherwise indicated.
 - 3. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.
- D. Housings:
 - 1. Extruded-aluminum or aluminum housing and heat sink.
 - 2. Powder-coat finish.
- E. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
 - 1. Label shall include the following lamp characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter, shape, size, wattage, and coating.
 - c. CCT and CRI for all luminaires.

2.4 METAL FINISHES

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.5 LUMINAIRE FIXTURE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: ½-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A 641, Class 3, soft temper, zinc-coated steel, 12-gauge.
- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

- A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and relamping.
 - 3. Provide support for luminaire without causing deflection of ceiling or wall.

4. Luminaire mounting devices shall be capable of supporting a horizontal force of one hundred twenty-five percent (125%) of luminaire weight and vertical force of four hundred percent (400%) of luminaire weight.

D. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four (4) locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

- E. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

- B. Luminaire will be considered defective if it does not pass operation tests and inspections.

- C. Prepare test and inspection reports.

3.6 ADJUSTING

- A. Occupancy Adjustments: When requested within twelve (12) months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two (2) visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265119