

TABLE OF CONTENTS

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

000115	List of Drawing Sheets Advertisement
001113	Advertisement for Bids
001116	Invitation to Bid
002113	Instructions to Bidders
004114	Bid Form

DIVISION 01 – GENERAL REQUIREMENTS

011000	Summary
012200	Unit Prices
012300	Alternates
012500	Substitution Procedures
012600	Contract Modification Procedures
012900	Payment Procedures
013100	Construction Progress Documentation
013300	Submittal Procedures
014000	Quality Requirements
014200	References
014500	Project Requirements
016000	Product Requirements
017300	Execution
017310	Cutting and Patching
017400	Warranties and Bonds
017419	Construction Waste Management and Disposal
017700	Closeout Procedures

DIVISION 02 – EXISTING CONDITIONS

024119	Selective Demolition
028213	<i>Asbestos Abatement Specification</i>
028416	<i>Handling of Lighting Ballasts and Lamps Containing PCBs and Mercury</i>

DIVISION 03 – CONCRETE

030130	Maintenance of Cast-in-Place Concrete
--------	---------------------------------------

DIVISION 04 – MASONRY

040120.63	Brick Masonry Repair
-----------	----------------------

DIVISION 05 – METALS

057300	Decorative Metal Railings
--------	---------------------------

(continued)

DIVISION 06 – WOOD, PLASTICS AND COMPOSITES

061000	Rough Carpentry
062023	Interior Finish Carpentry
064116	Plastic Laminate Faced Architectural Cabinets

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

078413	Penetration Firestopping
079200	Joint Sealants
079219	Acoustic Joint Sealants

DIVISION 08 – OPENINGS

081113	Hollow Metal Doors and Frames
081416	Flush Wood Doors
083113	Access Doors and Frames
087100	Door Hardware
088000	Glazing
088813	Fire-Resistant Glazing

DIVISION 09 – FINISHES

092216	Non-Structural Metal Framing
092900	Gypsum Board
095113	Acoustic Panel Ceilings
096513	Resilient Base and Accessories
099123	Interior Painting
099200	Concrete Floor Paints
099300	Staining and Transparent Finishing

DIVISION 21 – FIRE SUPPRESSION

210500	Common Work Results for Fire Suppression
211300	Wet Sprinkler Systems

DIVISION 22 – PLUMBING

220500	Common Work Results for Plumbing
220700	Plumbing Insulation
221000	Plumbing Piping and Pumps

DIVISION 23 – HEATING, VENTILATING and AIR CONDITIONING (HVAC)

230500	Common Work Results for HVAC
230700	Insulation Systems
230800	Commissioning of Systems
233000	Basic Materials and Methods
233700	HVAC Equipment
238100	Variable Refrigerant Flow Air Conditioning Systems
238120	Building Management System - Bid Alternate No. 3

(continued)

DIVISION 26 – ELECTRICAL

260500	Common Work Results for Electrical
260505	Basic Material and Methods
260519	Wire and Cable
260526	Grounding and Bonding
260529	Hangers and Supports
260533	Conduit
260548	Seismic Bracing
260553	Electrical Identification
262416	Panelboards
262726	Electrical Devices
262813	Fuses
262816	Enclosed Switches and Circuit Breakers
262950	Mechanical Equipment Controls
265100	Lighting
266100	Commissioning

DIVISION 32 – EXTERIOR IMPROVEMENTS

323120	Decorative Vinyl Fences and Gates
--------	-----------------------------------

LIST OF EXHIBITS

Exhibit A	Contractor’s Insurance
Exhibit B	Scope of Work
Exhibit C	Limited Hazardous Building Materials Inspection Report
Exhibit D	Prevailing Wage Rates
Exhibit E	Sample Model and CAD Files License Agreement

LIST OF DRAWING SHEETS

GENERAL INFORMATION

G-000	COVER SHEET
G-100	GENERAL NOTES, TYPICAL MOUNTING LEGENDS, PARTITION SCHEDULE, AND DOOR SCHEDULE
G-101	ROOF FINISH SCHEDULE
G-200	FIRST AND SCOND FLOOR CODE PLANS AND OCCUPANCY TABLES

CIVIL

S-1	SITE DEVELOPMENT PLAN
-----	-----------------------

ARCHITECTURAL SITE

AS-100	PARTIAL ARCHITECTURAL SITE PLAN
--------	---------------------------------

DEMOLITION

D-100	DEMOLITION FLOOR PLANS
D-200	DEMOLITION REFLECTED CEILING PLANS

ARCHITECTURAL

A-100	FIRST FLOOR PLAN
A-101	SECOND FLOOR PLAN
A-200	FIRST FLOOR REFLECTED CEILING PLAN
A-201	SECOND FLOOR REFLECTED CEILING PLAN
A-300	DETAILS
A-301	DETAILS- INDOOR PLAY AREA
A-302	CASEWORK DETAILS & SCHEDULE
A-400	INTERIOR ELEVATIONS- INDOOR PLAY AREA
A-401	INTERIOR ELEVATIONS

FF&E DRAWINGS

AF-100	FIRST FLOOR FF&E PLAN- FOR REFERENCE ONLY
AF-101	SECOND FLOOR FF&E PLAN- FOR REFERENCE ONLY

PLUMBING & FIRE PROTECTION

F-100	FIRST FLOOR PLAN- FIRE PROTECTION
F-101	SECOND FLOOR PLAN- FIRE PROTECTION
P-100	FIRST FLOOR PLAN- PLUMBING
P-101	SECOND FLOOR PLAN- PLUMBING

MECHANICAL

M-100	FIRST FLOOR PLAN
M-101	SECOND FLOOR PLAN
M-200	VRF SYSTEM WIRING SCHEMATICS
M-201	VRF SYSTEM PIPING SCHEMATICS
M-202	VRF SYSTEM PIPING SCHEMATICS

ELECTRICAL

E-100 FIRST FLOOR PLAN
E-101 SECOND FLOOR PLAN
E-200 FIRST FLOOR PLAN- FIRE ALARM
3-201 SECOND FLOOR PLAN- FIRE ALARM
E-300 ELECTRICAL RISERS AND DETAILS

HAZARDOUS MATERIALS

HM-001 HAZARDOUS MATERIALS ABATEMENT PLAN

**Legal Notice
Request for Qualifications / Proposals**

For
GENERAL CONTRACTOR
For

Area Cooperative Educational Services (ACES)

ACES INTERIOR RENOVATION & IMPROVEMENTS TO 300 WASHINGTON STREET

300 Washington St.

Middletown, Ct.

Issue date: 07/31/2017

ACES PROJECT NUMBER: 2017-1

Area Cooperative Educational Services (ACES) is requesting Lump Sum Proposals from Qualified Experienced Contractors for Interior Renovation & Improvements to our Early Head Start facility located at 300 Washington Street, Middletown, Ct. The scope of services includes but is not limited to, Hazardous Abatement, Demolition, HVAC, Fire Sprinkler and Protection, Plumbing and Interior Work, and all related construction administrative services for this project.

A **mandatory** pre-bid conference will be held at the site on **August 7, 2017 at 2:30 PM** at the Project site location in Middletown, CT.

Copies of RFQ/P will be available August 1, 2017

The RFQ/P can be obtained at

<http://www.aces.org/administration/request-for-proposals>

Proposals are to be submitted to:

Area Cooperative Educational Services (ACES)

350 State Street

North Haven, Connecticut 06473-3018

Attention: Timothy Gunn, Director of Facilities & Construction

All Proposals shall be delivered by **2:30 pm August 15, 2017**.

Area Cooperative Educational Services is an equal opportunity employer who does not discriminate on the basis of race, color, age, ethnicity, national origin, religion, gender, marital status, disability or sexual orientation.

INVITATION TO BID

August 1, 2017

Attention: Bidders
Regarding: **ACES INTERIOR RENOVATION & IMPROVEMENTS TO 300 WASHINGTON STREET**

Dear Bidders:

Enclosed please find Bid Documents for all **ACES INTERIOR RENOVATION & IMPROVEMENTS TO 300 WASHINGTON STREET** located in Middletown, Connecticut.

A **mandatory** pre-bid conference for Bidders will be held on **August 7, 2017** at **2:30** p.m. at the facility located at 300 Washington Street Middletown, CT.

One (1) original and three (3) copies of your Bid Submission is required to be submitted and addressed to:

Timothy Gunn
Director of Facilities and Construction
ACES Administration Building
350 State Street
North Haven, CT 06473

The envelope is to be labeled: **ACES INTERIOR RENOVATION & IMPROVEMENTS TO 300 WASHINGTON STREET – Sealed Bid Enclosed.**

Accordingly, we have included in the Bid Package: Project Manual, a sample Contract, Exhibits A and B, Specifications & Drawings, Hazardous Material Report and Hazardous abatement documents for bidding purposes.

Bidders may obtain Bidding Documents at ACES website:

<http://www.aces.org/administration/request-for-proposals>

It is the bidder's responsibility to review and obtain complete sets of the Bidding Documents in preparing their Bids.

One (1) original and three (3) copies of your Bid Submission is required to be submitted, on the enclosed forms to ACES Administration Building, 350 State Street North Haven, CT 06473 on August 15, 2017 by 2:30 p.m.

Please note that the blanks you must fill in on the Proposal Form and the accompanying Exhibits are on the following pages. **(Only these listed pages need to be returned as part of your Bid Submission):**

Bid Form	Page: All
Statement of Bidders Qualifications	Page: All
Affirmative Action Policy Statement	Page: One
Non-Collusion Affidavit of Bidder	Page: One
Acceptance of Contract Terms	Page: One
Exhibit B – Scope of Work	Page: Signature Page
Unit Price Schedule per Section 012200 Part 3	Pages: All Items

ACES – Interior Renovations & Improvements
300 Washington Street
Middletown CT 06547

Invitation to Bid
000116-1
Issued for Bid- July 28, 2017

ACES reserve the right to reject any and all Bid Submissions, to waive any formality, technicality, or irregularity in any Bid Submission.

If you should have any questions concerning this Project, please contact Karin Patriquin A.I.A of Patriquin Architects at email: karin@patriquinarchitects.com and copy tgunn@aces.org.

All questions regarding Hazardous abatement work please contact Eric Cooley of Fuss & O'Neill at ecooley@fando.com with copies to karin@patriquinarchitects.com and tgunn@aces.org.

In closing, we thank you in advance for your Bid Submission.

Very truly yours,
ACES

Tim Gunn

Timothy Gunn
Director of Facilities and Construction

cc: Bid File

1.1 DEFINITIONS

- A. Bidding Documents include the Bidding Requirements and the Contract Documents.
- B. The Bidding Requirements consist of:
 - 1. The Invitation to Bid
 - 2. The Instructions to Bidders
 - 3. The Bid Form
 - 4. ACES Contract, including Exhibits A Contractors Insurance Requirements, Exhibit B Scope of Work.
- C. The Contract Documents consist of:
 - 1. The form of Agreement will be a modified A107-2007 between the Owner and Contractor for a Project of Limited Scope.
 - 2. Drawings.
 - 3. Specifications.
 - 4. Addenda issued prior to execution of the Contract.
- D. Owner is the Area Cooperative Education Services (ACES).
 - 1. Owner's Designated Representative is Timothy Gunn.
- E. Architect is Patriquin Architects, LLC.
- F. Environmental Consultant is Fuss & O'Neill (EnviroScience, LLC)
- G. Addenda are written or graphic instruments issued by the Architect prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.
- H. A Bid is the complete and properly signed proposal to do the Work for the sums stipulated therein. A bid is considered complete if it is submitted according to the terms of the Bidding Documents.
- I. The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids.
- J. An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.
- K. A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment or services for a portion of the Work identified in the Bidding Documents.
- L. A Bidder is a person or entity who submits a Bid.
- M. A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment and/or

labor for a portion of the Work.

- N. The Successful Bidder is the Bidder to whom the Owner (ACES) makes an award.
- O. Definitions established in the Contract Documents are applicable to the Bidding Documents.

1.2 BIDDER'S REPRESENTATIONS

- A. By making a Bid, the Bidder represents that:
 - 1. The Bidder has carefully examined the Bidding Documents, the requirements are clear, and concurs with them. The Bid is made in full agreement with those requirements.
 - 2. The Bidder understands the requirements of the Bidding Documents to the extent that such documentation relates to the Work for which the Bid is submitted, for other portions of the Project, if any, being bid concurrently or presently under construction.
 - 3. The Bidder and appropriate Sub-bidders have visited the site, have become familiar with local conditions under which the Work is to be performed and have correlated the Bidder's personal observations with the requirements of the Bidding Documents.
 - 4. The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception or qualification.
 - 5. The Bidder has not colluded with any other person in regard to any Bid or sub-bid submitted.

1.3 BIDDING DOCUMENTS

- A. Documents are available only in complete sets. Bidders may obtain Bidding Documents at the ACES website: <http://www.aces.org/administration/request-for-proposals>
 - 1. Note it is the bidder's responsibility to review and obtain complete sets of the Bidding Documents in preparing their Bids.
 - 2. Bidders shall use complete sets of Bidding Documents in preparing Bids. The Owner and the Architect assume no responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
 - 3. Copies of the Bidding Documents are made available for the sole purpose of obtaining Bids on the Work. No license or permission is granted for any other use of the Bidding Documents.

1.4 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

- A. The Bidder shall carefully study and compare the Bidding Documents with each other, and with the site and local conditions. He shall request documents for other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted. If inconsistencies or ambiguities are discovered, the Bidder shall immediately report them to the Architect and Owner.
- B. Requests for clarification or interpretation of the Bidding Documents shall be made in writing. The Architect/Engineer will accept requests for clarifications up until five (5) working days prior to the date the Proposal is to be submitted. Clarification or Questions can be emailed to Karin Patriquin at Karin@PatriquinArchitects.com with copies to tgunn@aces.org. All questions regarding Hazardous abatement work must be directed to Eric Cooley of Fuss & O'Neill at ecooley@fando.com with copies to karin@patriquinarchitects.com and tgunn@aces.org.

- C. Interpretations, corrections and changes of the Bidding Documents will be made by written Addendum. Interpretations, corrections and changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon them.

1.5SUBSTITUTIONS

- A. The materials, products and equipment described in the Bidding Documents establish the standard required for the function, dimension, appearance and quality to be met by any proposed substitution.
- B. No substitution will be considered prior to receipt of Bids unless the written request for approval has been received by the Architect by the date stipulated in the Invitation to Bid. Such requests shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work including changes in the work of other contracts that incorporation of the proposed substitution would require shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.
- C. If the Architect approves a proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner.
- D. No substitutions will be considered after the Contract award unless specifically provided in the Contract Documents.
- E. Refer to Section 012500 "Substitution Procedures".

1.6ADDENDA

- A. Addenda will be delivered promptly by the issuing office to all Bidders.
- B. Addenda concerning technical matters will not be issued later than the stipulated day prior to the date for receipt of Bids. The Owner reserves the right to issue an Administrative Addendum at any time, withdrawing the request for Bids or postponing the date for receipt of Bids.
- C. Each Bidder shall confirm, prior to submitting a Bid that the Bidder has received all Addenda issued. The Bidder shall list the Addenda in the Bid.

1.7BIDDING PROCEDURES

- A. The form and style of Bids shall conform to the Bid Form, provided with the Bid Documents.
 - 1. Bids shall be submitted on forms identical to the form supplied with the Bidding Documents.
 - 2. Completely fill in all blanks on the bid form. Use typewriter or ink.
 - 3. Express sums in both words and figures. In case of discrepancy between the two (2), the amount written in words shall govern.
 - 4. Interlineations, alterations and erasures must be clearly legible and initialed by the signer of the Bid.

5. All requested Alternates shall be bid. If no change in the Base Bid is required, enter *No Change*.
6. On each copy of the Bid, include the legal name of the Bidder and a statement that defines the circumstance of ownership and control. The name of each person signing the proposal shall be typed or printed below the signature. When the proposal is signed by an agent of the Bidder, include evidence of current power of attorney. In every case, the proposal shall show the present business address of the Bidder, at which address communications will be received and service of notices accepted.
 - a. If the Bidder is a corporation, the proposal shall be signed in the name of the corporation and sealed by a duly authorized officer of the corporation.
 - b. If the Bidder is a partnership, the proposal shall be signed in the name or title under which the organization is doing business by an officer whose official capacity shall be designated.
 - c. If the Bidder is an individual, that individual shall sign the proposal in person, stating the name or title, if any, under which that individual is doing business.
7. The following bid documents are to be submitted by the Bidder. All information and blanks must be filled in on the Proposal Form, the noted Exhibit pages as indicated below (only these listed pages of the Exhibits need to be returned as part of your Bid Submission).

Bid Form	Page: All
Statement of Bidders Qualifications	Page: All
Affirmative Action Policy Statement	Page: One
Non-Collusion Affidavit of Bidder	Page: One
Acceptance of Contract Terms	Page: One
Exhibit B – Scope of Work	Page: Signature Page
Unit Price Schedule per Section 012200 Part 3	Pages: All Items

1.8 NOT USED

1.9 SUBMISSION OF BIDS

- A. One (1) original and three (3) copies of the Bid and other documents required to be submitted with the Bid shall be enclosed in a sealed envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address and, the designated Bid Package of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope labeled *SEALED BID ENCLOSED*.

Bids submitted VIA: U.S. Mail, Overnight Mail or Hand

Timothy Gunn
 Director of Facilities and Construction
 ACES Administration Building
 350 State Street
 North Haven, CT 06473

- B. Bid Submission is required to be submitted, on the enclosed forms to **ACES Administration Building, 350 State Street North Haven, CT 06473** on **August 15, 2016** by **2:30 p.m.**
- C. Bids shall be deposited at the designated location prior to the time and date for receipt of Bids.
- D. The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.
- E. Oral, telephonic or telegraphic Bids are invalid and will not receive consideration.

1.10 MODIFICATION OR WITHDRAWAL OF BID

- A. A Bid may not be modified by the Bidder following the time and date designated for the receipt of Bids.
- B. A Bid submitted prior to the time and date designated for receipt of Bids, may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing and signed by the Bidder. If notice is sent by telegram, written confirmation shall be mailed and postmarked on or before the date and time set for receipt of Bids. Any change shall be so worded as not to reveal the amount of the original Bid.
- C. Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

1.11 CONSIDERATION OF BIDS

- A. The properly identified Bids received on time at Area Cooperative Education Services Administration Building, will be opened publicly and read aloud.
- B. The Owner and Construction Manager reserve the right to:
 - 1. Reject any or all Bids.
 - 2. Reject a Bid not accompanied by data required by the Bidding Documents.
 - 3. Reject a Bid which is in any way incomplete or irregular.

1.12 ACCEPTANCE OF BID

- A. It is the intent of the Owner to award a Contract to the lowest responsible Bidder offering the optimum combination of cost, service and schedule, provided that the apparent Low Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner reserves the right to accept or reject any or all bids and to award the contract to the bidder deemed to be for its best interest.
- B. The Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the low Bidder on the basis of the sum of the Base Bid and Alternates accepted.
- C. The Bidder will be required to establish to the satisfaction of the Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

- D. Prior to the award of the Contract, the Owner or Architect will notify the Bidder in writing if it has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, (1) withdraw the Bid, or (2) submit an acceptable substitute person or entity with an adjustment in the Base Bid or Alternate Bid to cover the difference in cost occasioned by such substitution. The Owner and Architect may accept the adjusted bid price or disqualify the Bidder.
 - E. Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.
- 1.13 NOT USED
- 1.14 INSURANCE
- A. The Successful Bidder shall submit Insurance Liability Coverage as per Exhibit C prior to commence of work on site.
- 1.15 LABOR AGREEMENT
- A. NOT USED
- 1.16 NON-RESIDENT CONTRACTORS
- A. At the time of contract, signing a certificate from the Commissioner of Revenue Services shall be provided which evidences that C.G.S. 12-430 for non-resident contractors has been met.
- 1.17 NOT USED
- 1.18 INCURRING COST
- A. Bidders are solely responsible for any and all cost or expenses incurred in the preparation and submission of this bid.
- 1.19 NOT USED
- 1.20 PRE –BID CONFERENCE
- A. A **mandatory** pre-bid conference for Bidders will be held on **August 7, 2017** at **2:30** p.m. at our facility located at 300 Washington Street Middletown, CT.
- 1.21 PRECONSTRUCTION CONFERENCE
- A. Soon after the actual award of the contract (but in any event prior to the start of construction), authorized representatives of the Contractor shall attend a Pre-Construction Conference. Participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the work. The Construction Manager will forward the agenda to the successful bidder. The location of this conference will be at the Project Site or another convenient location as directed by the Construction Manager.

1.22 MISCELLANEOUS PROVISIONS

- B. A Bidder shall complete and include signed copies of the following documents as part of its Proposal: (i) Non Collusion Affidavit of Bidder, (ii) Statement of Bidder's Qualifications, (iii) Affirmative Action Policy Statement and (iv) Acceptance of Contract Terms.

(Documents set forth on following pages)

NON COLLUSION AFFIDAVIT OF BIDDER

State of _____) SS.
County of _____)

_____ being first duly sworn, deposes and say that:

- (1) He is _____, of _____ herein referred to as the "Bidder" that has submitted the attached Proposal;
- (2) He is fully informed respecting the preparation and content of the attached Proposal and of all pertinent circumstances respecting such Proposal;
- (3) Such Proposal is genuine and is not a collusive or sham Proposal;
- (4) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly with any other Bidder, firm or person to submit a collusive or sham Proposal in connection with the Contract for which the attached Proposal has been submitted or to refrain from bidding in connection with such Contract, or has in any manner directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person to fix the price or prices in the attached Proposal or of any other Bidder, or to fix any overhead, profit or cost element of the Proposal price or the Proposal price of any other Bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the Area Cooperative Educational Services (ACES), or any person interested in the proposed Contract; and
- (5) The price or prices quoted in the attached Proposal are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties of interest, including this affiant.
- (6) That no officer or employee or person whose salary is payable in whole or in part from the Area Cooperative Educational Services (ACES) is directly or indirectly interested in this Proposal, or in the equipment, supplies, materials, work or labor to which it relates, or in any of the profits thereof.

Signed _____
Title

Subscribed and sworn before me this

_____ day of _____ 20__

(Notary Public)

My Commission expires_____

STATEMENT OF BIDDER'S QUALIFICATIONS

All items and questions must be answered and the data given must be clear and comprehensive. This statement must be notarized. If necessary, questions may be answered on separate attached sheets. The bidder may submit any additional information it desires.

1. Name of Bidder _____
2. Bidder's Tax Identification No. _____
3. Permanent main office address _____

4. When organized _____
5. If corporation, where incorporated _____

6. Number of years have you been engaged in the contracting business under your present firm or trade name _____
7. Contracts on hand: (Schedule these showing amount of each contract and the appropriate anticipated dates of completion) _____

8. General character of work performed by your company _____

9. Have you ever failed to complete any work awarded to you? If so, where and why? _____

10. Have you ever defaulted on a contract? If so, where and why? _____

11. List the more important projects recently completed by your company, stating the approximate cost for each, and the month and year completed (use a separate sheet if necessary) _____

12. List your major equipment available for this Contract _____

13. List your experience in work similar to this Project _____

14. List the background and experience of the principal members of your organization, including officers

15. List the work to be done by Subcontractors and summarize the dollar value of each Subcontract _

16. Credit available _____

17. Bank Reference _____

18. Will you, upon request, fill out a detailed financial statement and furnish any other information that may be required by the Owner? _____

The undersigned hereby authorizes and requests any person, firm or corporation to furnish any information requested by the Owner in verification of the recitals comprising this Statement of Bidder's Qualifications.

State of _____) _____
_____) SS. (Name of Bidder)

County of _____) By _____
Title _____
Date: _____

being duly sworn deposes and says that (s)he is _____ of _____,
and that the answers to the foregoing items and questions and all statements therein contained are true and correct.

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

(Notary Public)

My Commission expires _____

AFFIRMATIVE ACTION POLICY STATEMENT

(must be submitted on your firm 's letterhead)

It has always been the policy and will continue to be the strong commitment of _____

_____ and all contractors and subcontractors who do business with Area Cooperative Educational Services (ACES) to provide equal opportunities in employment to all qualified persons solely on the basis of job-related skills, ability and merit.

_____ will continue to take Affirmative Action to ensure that applicants are employed and that employees are treated during employment without regard to their race, color, religion, sex, national origin, ancestry, mental disorder (present or past history thereof), age, physical disability (but not limited to blindness), marital status, mental retardation, and criminal record. Such action includes, but is not limited to, employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation and selection for training including apprenticeship, and its subcontractors will continue to make good faith *efforts* to comply with all federal and state laws and policies which speak to equal employment opportunity.

The principles of Affirmative Action are addressed in the 13th, 14th, and 15th Amendments of the United States Constitution, Civil Rights Act of 1866, 1870, 1871, Equal Pay Act of 1963, Title VI and VII of - the 1964 United States Civil Rights Act, Presidential Executive Orders 11246, amended by 11375, (nondiscrimination under federal contracts), Act I, Sections 1 and 20 of the Connecticut Constitution, Governor Grasso's Executive Order Number 11, Governor O'Neill's Executive Order Number 9, the Connecticut Fair Employment Practices Law (Sec. 46a-60-69) of the Connecticut General Statutes, Connecticut Code of Fair Practices (46a-70-8 1), Deprivation of Civil Rights (46a-58(a)(d)), Public Accommodations Law (46a-63 -64), Discrimination against Criminal Offenders (46a-80), definition of Blind (46a-51(1)), definition of Physically Disabled (46a-51(15)), definition. of Mentally Retarded (46a-51(13)), cooperation with the Commission on Human Rights and Opportunities (46 - 77), Sexual Harassment (46a-60(a)-8), Connecticut Credit Discrimination Law (36-436 through 439), Title I of the State and Local Fiscal Assistance Act of 1972.

This Affirmative Action Policy Statement re-affirms my personal commitment to the principles of Equal Employment Opportunity.

Date

Signature of Authorized Signer

ACCEPTANCE OF CONTACT TERMS

_____ as a condition of satisfying Invitation to Bid requirements of that certain document entitled "ACES Renovations of 300 Washington Street" hereby accepts the terms and conditions of the Contract included and such exhibits and attached to said bid document **without** exception.

Authorized Signature

Date

Title

Printed Name

TO: Area Cooperative Education Services (ACES)
350 State Street
North Haven, CT 06473

FROM:

Proposal Submitted By: _____

Bid Proposal Date: _____

Address: _____

Phone #: _____

Email: _____

Project: ACES INTERIOR RENOVATIONS & IMPROVEMENTS TO 300 WASHINGTON STREET

BASE BID:

We have examined the Contract Documents and the site for the captioned project. We are familiar with all of the requirements of the Documents and existing conditions relative to the execution of this Work. The above noted Bidder hereby proposes to furnish and install all work, labor, material, transportation, protection, apparatus, engineering, equipment, tools, scaffolds, appliances, documentation, services, and all other means and conditions necessary for this Project including, but not limited to, all Work required by the Project Drawings and Specifications, Project Manual dated **July 28, 2016**, the Scope of Work as itemized in Exhibit "B", and all requirements of the ACES Agreement for the totally inclusive lump sum amount of:

TOTAL LUMP SUM AMOUNT (Words)

TOTAL LUMP SUM AMOUNT (Figures)

\$ _____

The following items are included in the Lump Sum Amount. The Cost break out for the following items of Work are:

All cost for providing the HVAC Equipment:

(Figures) \$ _____ (Words) _____

All cost for providing Bonding:

(Figures) \$ _____ (Words) _____

The following item(s) are add Alternatives. These items can be added to the Agreement only through written acceptance by ACES:

1. Furnish & Install all outlet boxes and conduit for IT on the second floor as shown on the contract documents:

(Figures) \$ _____ (Words) _____

2. Furnish and Install all new electrical, boxes, outlets and power for a complete installation for the second floor as shown on the contract documents under Add Alternate No. 1:

(Figures) \$ _____ (Words) _____

3. Furnish and Install all new door lever hardware as shown on the contract documents under Add Alternate No. 2:

(Figures) \$ _____ (Words) _____

4. Furnish and install a fully functional BMS compatible with the new heat pumps and controls as shown on the contract documents under Add Alternate No. 3:

(Figures) \$ _____ (Words) _____

This Bid Package proposal price is valid for ninety (90) calendar days from the date of the bid opening.

Bidder shall not include in their bid proposal nor shall they charge for any state, local or federal taxes for any fixtures or property to become a permanent part of the project due to ACES exempt status. The Bidder is responsible for all other project related state, local or federal taxes that are not exempt.

The Bidder shall include the cost of all required Local Building Permits and Utility Connection Fees.

LOWER TIER SUBCONTRACTS

The successful bidder shall provide a list of lower tier subcontractors and vendors/suppliers that it has awarded contracts for this Project to within ten (10) days of award to lower tier subcontractors and vendors/suppliers. List shall include lower tier subcontractors or vendor/suppliers name, address, telephone and fax numbers, contact person, work being performed, FEIN/Social Security numbers and Connecticut Tax Registration Numbers.

The following is Contractors **proposed** subcontractors for the trade indicated. Contractor to provide a list of lower tier subcontractors and vendors/suppliers after it has awarded as noted above.

Hazardous Abatement: _____

Fire Protection & Sprinkler: _____

HVAC: _____

Plumbing: _____

Electrical: _____

ADDENDUM RECEIPT

The undersigned hereby acknowledges receipt of Addenda Nos. __ through __ inclusive and have included their provisions in the Bid.

ERROR CERTIFICATION

The undersigned certifies that the attached list includes any and all defects, errors, inconsistencies or omissions in the Bidding Documents of which he is aware, either directly, or by notification from any sub-bidder or material supplier.

If none, enter *NONE*: _____

In submitting this Bid, I agree:

To accept all provisions of the Project Contract, Project Manual including Drawings and Addenda.

If awarded on the basis of this bid, to enter into and execute the ACES Agreement without modifications, and shall return fully executed Agreement to ACES within seven (7) days upon receipt of Agreement

To accomplish the Work in accordance with the Contract Documents, in the time stipulated therein.

To cooperate in every respect with the Architect and Owner and other contractors, subcontractors working on this Project. Including cooperating with the suppliers and installers of equipment, if any, purchased by the Owner under separate contracts.

The undersigned further attests and affirms that:

The Bidder has not colluded with any other person in regard to this Bid or any component Sub-bid. No person employed by the Contractor has exercised influence, provided confidential information, or stands to profit from this Bid or the Work described in the Bid Documents.

The Bidder has a current appropriate license from the State of Connecticut.

The Bidder is not presently barred from bidding or performing work in any jurisdiction, due to noncompliance with Affirmative Action or Equal Opportunity regulations. The Bidder is not on the list of disqualified contractors maintained by the Connecticut Department of Labor for persons or firms who have been found to disregard of their obligations under Connecticut General Statutes §31-53, et seq. as amended, and Connecticut General Statutes §31-76, nor have they been barred from Federal Government contracts in accordance with the provisions of the Davis-Bacon Act, 40 U.S.C §276a-2.

BIDDER

Name of Firm _____

Address _____

Signature _____

Title _____

Date _____

(Corporate Seal, if applicable)

All spaces must be filled in the bids to be formal. If bidder is a corporation, write state of incorporation. If partnership, give full names of all partners. Attach copy of current Power of Attorney if appropriate.

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Owner-furnished products.
 - 4. Access to site.
 - 5. Coordination with occupants.
 - 6. Work restrictions.
 - 7. Specification and drawing conventions.
 - 8. Miscellaneous provisions.

1.3 PROJECT INFORMATION

- A. Project Identification: ACES - Middletown.
 - 1. Project Location: 300 Washington Street, Middletown, CT.
- B. Owner: Area Cooperative Educational Services ("ACES")
 - 1. Owner's Representative: Tim Gunn.
- C. Architect: Patriquin Architects, 20 Grand Avenue, New Haven, CT, 06513; tel.: 203.535.1688.
 - 1. Architect's Project Representative: Paolo Campos, AIA, NOMA
- D. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:
 - 1. MEPFP Engineer: Acorn, Inc., P.O. Box 311 – Farms Village Plaza, 224 Farms Village Road, West Simsbury, CT; tel.: 860.651.1949.

2. Civil Engineer: Osprey Engineering, 146 E Main Street, Clinton CT 06413; tel.: 860-669-8651.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of selective demolitions, renovations and upgrades to the existing day care and office facility at the project site as follows:
 1. New fire sprinkler system- includes new buried water service from city supply line, new backflow preventer apparatus, new sprinkler distribution systems at both the first and second floors, and new fire alarm system. Sprinklers will be concealed at the first floor and exposed at the second floor. A new fire department connection, annunciator and fire alarm / security controls panels, and Knox box key vault are also included in the scope of work.
 2. New VRF ductless split system for space heating and cooling, including exterior condensing units, interior distribution consoles and controls. Existing electric baseboard radiators and thermostat controls will be demolished from the classrooms, offices and bathrooms.
 3. Selective cutting and patching of existing site elements such as driveways and curbs as required to install the new buried sprinkler service. A new privacy fence will be provided in front of the exterior condensing units.
 4. Demolition of the existing first floor suspended ceiling system to allow for installation of new sprinkler and HVAC systems. Existing first floor lighting shall remain- contractor to provide temporary supports for lighting during ceiling demo, FP and HVAC work.
 5. Installation of new suspended ceiling grid system.
 6. Replacement of certain existing fire stair and exit doors with new hollow metal doors and code-compliant exit hardware. Upgrade of existing railings at 2nd floor stair landings to comply with guard rail height requirements.
 7. Installation of new casework and countertops in two Infant Toddler and one Preschool Classroom. The new casework will replace existing casework in the same location, and includes reusing existing plumbing elements such as faucets, sinks, and piping.
 8. Installation of a new kitchenette in the common first floor hall area. The existing kitchenette which faces into the sunken play area will be reworked with a new floor infill platform, casework, and counters facing into the common hallway. Existing plumbing elements will be reused, as will existing appliances such as the refrigerator, dishwasher, and microwave.
 9. A new code-compliant guard rail will be provided for the sunken play area in the form of a custom-built millwork & storage assembly.

10. New electrical outlets, telecoms and IT outlets will be installed in first floor classrooms.
11. New framed stud and drywall partitions, hollow metal door frames, and wood doors at new first floor kitchenette and mechanical service closets.
12. Add Alternates shall be included in the bidders' scope as follows:
 - a. Provide additional electrical, data and telecoms outlets at the second floor offices as indicated on the drawings
 - b. Replace existing door hardware (knobs) with new lever style door handles with operation / function as shown on the contract drawings. Bidders shall survey existing hardware in field to confirm quantities;
 - c. New BMS operation system for VRF ductless split system as detailed on the drawings
13. Refer to Exhibit B of the project manual for additional information.

B. Type of Contract:

1. Project will be constructed under a single prime contract.
2. The project is subject to the State of Connecticut Department of Labor Prevailing Wages. Please refer to Exhibit D for current rates.
3. Contractor Qualifications: An experienced general contractor with a minimum of eight (8) years of experience in interior construction and associated Work. In addition, the Contractor must prove experience in similar type and monetary value. Contractor must have sufficient resources to perform the specified Work concurrently at all schools while meeting the project deadlines. Contractors that cannot comply with these qualifications will not be considered for the project.

1.5 OWNER-FURNISHED PRODUCTS

- A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products.
- B. Owner-Furnished Products:
 1. Diaper-changing station, cubbies and wall cabinets.

1.6 CONTRACTOR USE OF PREMISES

- A. Contractor shall coordinate its' Work activities with the Owner on a daily basis and advise the Owner of its scheduled activities two (2) weeks in advance.
- B. General: Limit use of the premises to construction activities in areas indicated; allow for Owner Occupancy and use by the public to the remainder of the building. Do not disturb portions of site beyond areas in which the Work is indicated.

- C. Confine operations to as small work area and access ways as possible. As much as possible and without damage to the finishes, doors, and related building systems, access the project via the side doors as designated by the Owner.
- D. Keep driveways and entrances serving the premises clear and available to the Owner, Owner's employees, 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.
 - 1. Schedule deliveries not to conflict with Owner's use of driveways and entrances. Contractor shall give ACES a minimum forty-eight (48) hour notice in writing.
 - 2. Contractor shall only Park in designated location as directed by ACES.
- E. Shall maintain existing egress patterns, exit doors and means of egress during construction, which will include the provision of temporary walkways, sideways, or other means necessary to provide adequate life safety for the building occupants, particularly at exit ways which must continue to remain open and serviceable while adjacent construction activity occurs.
- F. Use of the Existing Building: Maintain the existing building in a weather tight 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. Keep the facility (building and grounds) clean on a daily basis. Perform a final cleaning of Work area(s) and adjacent areas effected by Contractor's Work activities. Repair any damage to the facility caused by Contractor's Work activities, including but not limited to landscaping, roads and curbs, lighting, etc.
- G. Contractor shall at its expense make all permanent connections and tie-ins during time that will not affect the operations of the school.

1.7 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: The Owner will occupy the site and existing building during the entire construction period. Cooperate with the Owner during construction operations to minimize conflicts and facilitate owner usage. Pre-schedule construction operations with the Owner for coordination of demolition operations and the location of dumpsters and construction staging areas. Perform the Work so as not to interfere with the Owner's operations. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
 - 2. Provide not less than 5 days' notice to Owner of activities that will affect Owner's operations.

3. Contractor shall supply all temporary ventilation and prevent unnecessary noise. Contractor shall take precautions to minimize the impact of its operation on the school. Contractor agrees to perform work that interferes with the school during off hours or weekends and holidays at no additional cost to ACES

1.8 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Contractor shall coordinate its Work and schedule activities with ACES facilities.
 1. Unless given written permission by ACES Facilities Department, no Work activities by the Contractor shall be performed during scheduled ACES and the Church activities: ACES will give the Contractor five (5) day notice of such events.
 2. Contractor shall perform the work in a manner to minimize the disruption to the Church activities
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 1. Notify Architect and Owner not less than five days in advance of proposed utility interruptions.
 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
 1. Notify Architect and Owner not less than five days in advance of proposed disruptive operations.
 2. Obtain Owner's written permission before proceeding with disruptive operations.
- E. Nonsmoking Building: Smoking is not permitted within the building or within 100 feet of entrances, operable windows, or outdoor-air intakes.
- F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
 1. Maintain list of approved screened personnel with Owner's representative.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations.
 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012200 – UNIT PRICES**PART 1 – GENERAL**

1.1 SUMMARY

- A. A unit price is an amount proposed by Bidders and stated on the Bid Form as a price per unit of measurement for materials or services that will be added to or deducted from the Contract Sum by Change Order in the event the project Scope of Work is altered.
- B. Unit prices include material, any direct or indirect expenses of the Contractor or Sub-Contractor, profit, insurance, bonding, and any applicable taxes. **The same unit price shall apply whether the work is added or deducted.**

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

3.1 UNIT PRICE SCHEDULE

- A. Unit Prices in accordance with the following schedule will apply to this Contract.

Item No. 1 – MINI CONTAINMENT PREPARATION TO ENCLOSE ASBESTOS ABATEMENT (up to 100 SF of material removal)

\$ _____ per containment

Item No. 2 – SMALL CONTAINMENT PREPARATION TO ENCLOSE ASBESTOS ABATEMENT (>100-250 SF of material removal)

\$ _____ per containment

Item No. 3 – MEDIUM CONTAINMENT PREPARATION TO ENCLOSE ASBESTOS ABATEMENT (>250-750 SF of material removal)

\$ _____ per containment

Item No. 4 – ASBESTOS FASCIA BOARD REMOVAL AND DISPOSAL AS ACM

\$ _____ per square foot

Item No. 5 – ASBESTOS MASONRY JOINT CAULK REMOVAL AND DISPOSAL AS ACM

\$ _____ per linear foot

Item No. 6 – ASBESTOS FIRE DOOR REMOVAL AND DISPOSAL AS ACM

\$ _____ per door slab

Item No. 7 – ASBESTOS LAMINATE BACKSPLASH ADHESIVE REMOVAL AND DISPOSAL AS ACM

\$ _____ per square foot

Item No. 8 –CORING/DRILLING 1” to 2” PENETRATIONS THROUGH MASONRY WALLS AND ASBESTOS VAPOR BARRIER

\$ _____ per penetration

Item No. 9 – ASBESTOS VAPOR BARRIER REMOVAL FROM MASONRY WALL

\$ _____ per square foot

Item No. 10 – ASBESTOS ASPHALTIC ROOF FLASHING REMOVAL AND DISPOSAL AS ACM

\$ _____ per square foot

Item No. 11 – ASBESTOS PIPE/PIPE FITTING INSULATION REMOVAL

\$ _____ per linear foot

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: Revise 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 revisions to alternates.

- C. Execute accepted alternates under the same conditions as other work of the Contract.
- 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. Alternate No. 1: Additional Second Floor Electrical and IT/Telecomms Outlets.

- 1. Base Bid: Install electrical, data and telecoms outlets at first floor only as indicated on the contract documents. Existing second floor spaces to remain as-is.
- 2. Alternate: Submit pricing to install additional electrical, data and telecommunications outlets at the second floor spaces noted on the contract documents.

B. Alternate No. 2: Upgrade Existing Door Hardware

- 1. Base bid: Existing door hardware to remain throughout the building except for select exit access doors scheduled to be replaced on the drawings.
- 2. Alternate: Submit pricing to replace existing door knobs with lever-handle type hardware at offices, classrooms, and classroom restrooms as indicated on the contract documents.

C. Alternate No. 3: Building Management System

- 1. Base bid: Furnish and install the specified heat pump system, including necessary controls and points required to install a fully integrated Building Management System at a future date.
- 2. Alternate: Furnish and install the specified heat pump system with fully integrated Building Management System. Include all controls, hardware and software requirements as noted on the contract documents.

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 Requirements:
 - 1. Section 012300 "Alternates" for products selected under an alternate.
 - 2. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

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 ACTION SUBMITTALS

- A. Substitution Requests: Submit three 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 13.1A.
 - 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 revisions 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 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 five (5) business days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within ten (10) business days of receipt of request, or seven 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 a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

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

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 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 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.
- B. Substitutions for Convenience: Due to the compressed project schedule, the Architect will consider requests for substitution if received within fifteen (15) 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 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 Requirements:
 - 1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the 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. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within seven (7) calendar 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 CSI Form 13.6D, "Proposal Worksheet Summary," and Form 13.6C, "Proposal Worksheet Detail."
- 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 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 CSI Form 13.6A, "Change Order Request (Proposal)," with attachments CSI Form 13.6D, "Proposal Worksheet Summary," and Form 13.6C, "Proposal Worksheet Detail."

1.5 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: See Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

1.6 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Changes 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. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for procedural requirements governing the handling and processing of allowances.
 - 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.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate 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 Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one 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. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
 5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 6. 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.
- 7. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
- 8. 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.
- 9. 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.

1.5 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. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as 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 of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit four (4) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within twenty-four (24) hours. One copy shall include waivers of lien, certified payroll, OSHA certification and similar attachments as required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. 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, before deduction for retainage, on each item.
 2. When an application shows completion of an item, submit final or full waivers.
 - a. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 3. Waiver Forms: Submit waivers of lien on ACES forms, executed by an officer of the company or authorized Contractor representative.
- G. Until the Contract Agreement is executed by both parties and all insurance and bond requirements are met by the Contractor, the Owner cannot accept and/or process any progress payments by the Contractor. However, commencement of Work by the Contractor shall constitute acceptance of the Owners Agreement, including all terms and conditions.
- H. Contractors requisition shall include a statement indicating the Contractors original Contract Value, status of contract value to date, value of fully executed Change Orders, Percent complete of fully executed change order work, Value and Status of pending change order work. Note Pending Change Order is defined as Work that this Contractor has been directed to proceed with in writing by the Owner. This statement shall also include the date such change orders and directives were issued to this Contractor, the date this Contractor submitted its pricing back to the Owner, a description of the Change order and a column for pertinent comments. This statement shall be in a format acceptable to the Owner. Be advised that the accuracy of the information contained in this statement is the Contractor's responsibility. Submission of this statement to the Owner does not constitute acceptance or approval by the Owner.
- I. In the event Contractor elects to include values for materials that are either stored on the project site or stored off site, the value for the Stored Materials must be separated and entered on the Continuation Sheet. In addition the application to the Owner for such stored materials will only be made after the Owner has authorized such and the following has been submitted:
- a) Proof of purchase including the price paid & payment for the materials.
 - b) Final Release from the vendor(s) supplying such materials.
 - c) Bill of Sale to the Owner.
 - d) A separate endorsement insuring the stored materials for their full value, which also names the Owner as an additional insured.

- J. If the Owner's Builder's Risk insurance contains Builders Risk Deductibles, this Contractor shall be responsible to pay said deductibles should the Contractor, its agents and/or employees' negligence be responsible for the compensable loss. In addition, the Contractor will insure, make known to and make a part of all sub-contractors agreements for the Project that each will be responsible for and pay the Owner's Builder's Risk insurance deductibles should the Contractor or sub-contractor or their agents and/or employees' negligence be responsible for the compensable loss. **The value of this deductible is \$ 0.00**
- K. Contractor shall submit their Schedule of Values to the Architect and the Owner **no later than Fifteen (15) Working days prior to its first requisition for Approval**. The Schedule of Values shall be in the format as required by the Contract Documents and as acceptable to the Architect and Owner. Contractor agrees to include all contract allowances and line items with a sufficient dollar value for the following items: Line item Labor & Material breakdown, Submittals, Scheduling, Safety, Clean up, Punch List, Close out Documents. Mobilization shall not be a line item, unless specifically allowed and approved. Contractor agrees to adhere to this requirement and that payment to this Contractor may not be processed, or payment withheld until Contractor complies.
- J. 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.
 5. Schedule of unit prices.
 6. Submittals 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. Certified Payroll
 15. OSHA Certifications
- K. 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.
- L. 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. All Warrantees and Guarantees
 3. All O& M Manuals
 4. Letter from Contractor certifying that no Hazardous material were used in the materials of construction including but not limited to Asbestos, PCB's, Lead.
 5. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 6. Updated final statement, accounting for final changes to the Contract Sum.
 7. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 8. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 9. AIA Document G707, "Consent of Surety to Final Payment." if applicable.
 10. Evidence that any and all claims have been settled.
 11. 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 when applicable.
 12. Final, liquidated damages settlement statement if applicable.

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 coordination procedures.
 - 2. Coordination drawings.
 - 3. Requests for Information (RFIs).
 - 4. Project meetings.
- B. Related Requirements:
 - 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 required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

- A. 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.
- B. Key Personnel Names: Within seven (7) 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 e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates 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.

1.5 GENERAL COORDINATION PROCEDURES

- 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 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. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.

- 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.

1.6 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally 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 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, structural, civil, 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 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. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
3. Structural Penetrations: Indicate penetrations and openings required for all disciplines.

4. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of piping and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, including, but not limited to, valves, access doors, cleanouts and electrical distribution equipment.
 5. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switch board, switchgear, and control center locations.
 - d. Location of pull boxes and junction boxes.
 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 Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
 2. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format.
 3. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - b. Contractor and subcontractor shall execute a data licensing agreement prior to receiving digital files. Please refer to Exhibit E for sample Model and CAD Files License Agreement.

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 suggested resolution 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, locations, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: AIA Document G716.
1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven 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 Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.

- d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. 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 5 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use CSI Log Form 13.2B. Include not less than the following:
- 1. Project name.
 - 2. Name and address of Contractor.
 - 3. Name and address of Architect.
 - 4. RFI number including RFIs that were returned without action or withdrawn.
 - 5. RFI description.
 - 6. Date the RFI was submitted.
 - 7. Date Architect's response was received.
- F. 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 five days if Contractor disagrees with response.
- 1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.8 PROJECT MEETINGS

- A. General: The Contractor shall schedule and conduct meetings and conferences at the Project site, unless otherwise indicated or instructed by ACES.
- 1. Attendees: The Contractor shall inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. The Contractor shall notify Owner, Subcontractor(s) and Architect of scheduled meeting dates and times. Meetings shall occur weekly while the Contractor is on site.
 - 2. Agenda: The Contractor shall prepare the meeting agenda and distribute the agenda to all invited attendees.

3. Minutes: The Contractor shall record significant discussions and agreements achieved, and distribute 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 ten (10) days after execution of the Agreement.
1. Conduct the conference to review responsibilities and personnel assignments.
 2. Attendees: Authorized representatives of Owner, 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. Critical work sequencing and long-lead items.
 - c. Designation of key personnel and their duties.
 - d. Lines of communications.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for RFIs.
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Distribution of the Contract Documents.
 - j. Submittal procedures.
 - k. Preparation of record documents.
 - l. Use of the premises and existing building.
 - 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. Construction waste management and recycling.
 - t. Parking availability.
 - u. Office, work, and storage areas.
 - v. Equipment deliveries and priorities.
 - w. First aid.
 - x. Security.
 - y. Progress cleaning.
 4. Minutes: Entity responsible for conducting meeting will record and distribute 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 and Owner 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. Possible conflicts.
 - i. Compatibility requirements.
 - j. Time schedules.
 - k. Weather limitations.
 - l. Manufacturer's written instructions.
 - m. Warranty requirements.
 - n. Compatibility of materials.
 - o. Acceptability of substrates.
 - p. Temporary facilities and controls.
 - q. Space and access limitations.
 - r. Regulations of authorities having jurisdiction.
 - s. Testing and inspecting requirements.
 - t. Installation procedures.
 - u. Coordination with other work.
 - v. Required performance results.
 - w. Protection of adjacent work.
 - x. 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 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 delivery of material samples, attic stock, and spare parts.
 - f. Requirements for demonstration and training.
 - g. Preparation of Contractor's punch list.
 - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - i. Submittal procedures.
 - j. Installation of Owner's furniture, fixtures, and equipment.
 - k. Responsibility for removing temporary facilities and controls.
 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at weekly 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: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - 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.

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. Startup construction schedule.
 - 2. Contractor's construction schedule.
 - 3. Construction schedule updating reports.
 - 4. Daily construction reports.
 - 5. Material location reports.
 - 6. Site condition reports.
 - 7. Special reports.
- B. Related Requirements:
 - 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 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF electronic file.
- B. Startup construction schedule.
 - 1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. 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.
- E. Construction Schedule Updating Reports: Submit with Applications for Payment.
- F. Daily Construction Reports: Submit at weekly intervals.
- G. Material Location Reports: Submit at weekly intervals.
- H. Site Condition Reports: Submit at time of discovery of differing conditions.
- I. 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 preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
 - 1. Review software limitations and content and format for reports.
 - 2. Verify availability of qualified personnel needed to develop and update schedule.
 - 3. Discuss constraints, including work stages, area separations, and interim milestones.
 - 4. Review delivery dates for Owner-furnished products.
 - 5. Review submittal requirements and procedures.
 - 6. Review time required for review of submittals and resubmittals.

7. Review requirements for tests and inspections by independent testing and inspecting agencies.
8. Review time required for Project closeout and Owner startup procedures.
9. Review and finalize list of construction activities to be included in schedule.
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, 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 Award to date of final 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 main element of the Work. Comply with the following:
 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 30 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 no fewer than 10 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 21 days for completion of punch list items 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. Products Ordered in Advance: Include a separate activity for each product. Include delivery date. Delivery dates indicated stipulate the earliest possible delivery date.
 3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date. Delivery dates indicated stipulate the earliest possible delivery date.
 4. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Use of premises restrictions.
 - e. Seasonal variations.
 - f. Environmental control.
 5. 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. Fabrication.
 - e. Deliveries.
 - f. Installation.
 - g. Tests and inspections.
 - h. Adjusting.
 - i. Curing.
 - j. Startup and placement into final use and operation.
- D. Milestones: Include milestones in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
- E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
1. See 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 Requests for Information.
 - 3. Rejected or unreturned submittals.
 - 4. Notations on returned submittals.
 - 5. Pending modifications affecting the Work and Contract Time.

- G. Recovery Schedule: When periodic update indicates the Work is 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 STARTUP CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven 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. Outline significant construction activities for first 30 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 15 days of date established for the Notice of Award. Base schedule on the startup construction schedule and additional information received since the start of Project.

- 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 10 percent increments within time bar.

2.4 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. Approximate count of personnel at Project site.
3. Equipment at Project site.
4. Material deliveries.
5. High and low temperatures and general weather conditions, including presence of rain or snow.
6. Accidents.
7. Meetings and significant decisions.
8. Unusual events (see special reports).
9. Stoppages, delays, shortages, and losses.
10. Meter readings and similar recordings.
11. Emergency procedures.
12. Orders and requests of authorities having jurisdiction.
13. Change Orders received and implemented.
14. Construction Change Directives received and implemented.
15. Services connected and disconnected.
16. Equipment or system tests and startups.
17. Partial completions.
18. 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. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site 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.

2.5 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one 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

1. Contractor shall employ skilled personnel with experience in scheduling and reporting techniques. Submit qualifications.
 2. Meetings: Scheduling personnel shall attend all meetings related to Project progress, alleged delays, and time impact.
- B. Contractor's Construction Schedule Updating: At weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule three work days 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.
- C. Distribution: Distribute copies of approved schedule to Architect, 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 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 Requirements:
 - 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.
- C. Contractor shall provide ACES an electronic PDF copy of all its submittals on a flash drive. Contractor shall transmit partial information to ACES on a monthly basis no later than the 10th of each month. If requested Contractor shall also forward at the conclusion of the project a complete electronic PDF copy of all submittals.

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 revisions to submittals noted by 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. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 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. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
 - 4. 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 date of fabrication.
 - h. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.

1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement.
 - c. The following digital data files will be furnished for each appropriate discipline:
 - 1) Floor plans.
 - 2) Reflected ceiling plans.

- 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.
 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. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow ten (10) days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow fifteen (15) days for initial review of each submittal.
 5. 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.

- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form 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., AMDC-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., AMDC-061000.01.A).
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
 4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
 - 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. Names of subcontractor, manufacturer, and supplier.
 - g. Category and type of submittal.
 - h. Submittal purpose and description.
 - i. Specification Section number and title.
 - j. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - k. Drawing number and detail references, as appropriate.
 - l. Location(s) where product is to be installed, as appropriate.
 - m. Related physical samples submitted directly.
 - n. Indication of full or partial submittal.
 - o. Transmittal number, numbered consecutively.
 - p. Submittal and transmittal distribution record.
 - q. Other necessary identification.
 - r. Remarks.
 5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
 - a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.

- E. Options: Identify options requiring selection by Architect.
- F. Deviations and Additional Information: 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.
- G. 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.
- H. 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.
- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action 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, unless otherwise noted.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - 2. 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 notarized statement on original paper copy certificates and certifications where indicated.
- 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.
 6. Submit Product Data in the following format:
 - a. PDF electronic file.
- 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, unless submittal based on Architect's digital data drawing files is otherwise permitted.
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 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
 3. Submit Shop Drawings in the following format:

- a. PDF electronic file.
 - b. Prepare Shop Drawings in the following format: Same digital data software program, version, and operating system as the original Drawings.
 - c. Refer to Section 013100 "Project Management and Coordination" for requirements for coordination drawings.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
- 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 - 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 - 4. 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.
 - 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit three full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return one set of submittal with options selected.
 - 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to,

the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

- a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- 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 or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
 5. Submit product schedule in the following format:
 - a. PDF electronic file.
- F. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."
- G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."
- I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- K. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."

- L. 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.
- M. 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 AWS forms. Include names of firms and personnel certified.
- N. 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.
- O. 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.
- P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- R. 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.
- S. Product Test Reports: Submit written reports indicating that 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.
- T. 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.
- U. 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.

- V. 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.
- W. Field Test Reports: Submit written 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.
- X. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 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.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file, and three paper copies of certificate, 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.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
 - 2. Prepare delegated-design drawings in the following format: Same digital data software program, version, and operating system as the original Drawings.

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: See 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. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. 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.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Architect without action.

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 construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction, are not limited by provisions of this Section.

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. Services do not include contract enforcement activities performed by Architect.
- C. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

- D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- E. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, 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(s).
- I. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum number 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 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 ACTION SUBMITTALS

- A. Shop Drawings: Provide plans, sections, elevations, and details, indicating materials, sizes, and coordination with other items and work.
 - 1. Indicate manufacturer and model number of individual components.
 - 2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.6 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. 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.
- C. 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.

1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice of Award, and not less than five 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 full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
 - 1. Project quality-control manager may also serve as Project superintendent.
- 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: In quality-control plan, include 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.
 - 2. 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.
- 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.

1.8 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.

- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.9 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.

- 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, 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.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. 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.

1.10 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.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
 - 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. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 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 Services:** Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.

4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: 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 inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

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.

- J. "Installer": An installer is the Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
- K. The term "experienced," when used with an entity, means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- L. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.
- C. Conflicting Requirements: If compliance with two (2) or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
 - 1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.
- D. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source and make them available on request.
- E. Abbreviations and Acronyms for Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the attached list. Names, telephone numbers, and Web site addresses are

subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

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 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. 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. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
8. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
9. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
10. AF&PA - American Forest & Paper Association; www.afandpa.org.
11. AGA - American Gas Association; www.aga.org.
12. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
13. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
14. AI - Asphalt Institute; www.asphaltinstitute.org.
15. AIA - American Institute of Architects (The); www.aia.org.
16. AISC - American Institute of Steel Construction; www.aisc.org.
17. AISI - American Iron and Steel Institute; www.steel.org.
18. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
19. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
20. ANSI - American National Standards Institute; www.ansi.org.
21. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
22. APA - APA - The Engineered Wood Association; www.apawood.org.
23. APA - Architectural Precast Association; www.archprecast.org.
24. API - American Petroleum Institute; www.api.org.
25. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
26. ARI - American Refrigeration Institute; (See AHRI).
27. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
28. ASCE - American Society of Civil Engineers; www.asce.org.
29. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
30. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
31. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
32. ASSE - American Society of Safety Engineers (The); www.asse.org.

33. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
34. ASTM - ASTM International; (American Society for Testing and Materials International); www.astm.org.
35. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
36. AWEA - American Wind Energy Association; www.awea.org.
37. AWI - Architectural Woodwork Institute; www.awinet.org.
38. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
39. AWPA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); www.awpa.com.
40. AWS - American Welding Society; www.aws.org.
41. AWWA - American Water Works Association; www.awwa.org.
42. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
43. BIA - Brick Industry Association (The); www.gobrick.com.
44. BICSI - BICSI, Inc.; www.bicsi.org.
45. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.com.
46. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
47. BOCA - BOCA; (Building Officials and Code Administrators International Inc.); (See ICC).
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bwfbadminton.org.
49. CDA - Copper Development Association; www.copper.org.
50. CEA - Canadian Electricity Association; www.electricity.ca.
51. CEA - Consumer Electronics Association; www.ce.org.
52. CFFA - Chemical Fabrics & Film Association, Inc.; www.chemicalfabricsandfilm.com.
53. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
54. CGA - Compressed Gas Association; www.cganet.com.
55. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
56. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
57. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
58. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
59. CPA - Composite Panel Association; www.pbmdf.com.
60. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
61. CRRC - Cool Roof Rating Council; www.coolroofs.org.
62. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
63. CSA - Canadian Standards Association; www.csa.ca.
64. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
65. CSI - Construction Specifications Institute (The); www.csinet.org.
66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
68. CWC - Composite Wood Council; (See CPA).
69. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
70. DHI - Door and Hardware Institute; www.dhi.org.
71. ECA - Electronic Components Association; www.ec-central.org.

72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECA).
73. EIA - Electronic Industries Alliance; (See TIA).
74. EIMA - EIFS Industry Members Association; www.eima.com.
75. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
76. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
77. ESTA - Entertainment Services and Technology Association; (See PLASA).
78. EVO - Efficiency Valuation Organization; www.evo-world.org.
79. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
80. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
81. FM Approvals - FM Approvals LLC; www.fmglobal.com.
82. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
83. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridarroof.com.
84. FSA - Fluid Sealing Association; www.fluidsealing.com.
85. FSC - Forest Stewardship Council U.S.; www.fscus.org.
86. GA - Gypsum Association; www.gypsum.org.
87. GANA - Glass Association of North America; www.glasswebsite.com.
88. GS - Green Seal; www.greenseal.org.
89. HI - Hydraulic Institute; www.pumps.org.
90. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
91. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
92. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
93. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
94. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
95. IAS - International Approval Services; (See CSA).
96. ICBO - International Conference of Building Officials; (See ICC).
97. ICC - International Code Council; www.iccsafe.org.
98. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
99. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
100. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
101. IEC - International Electrotechnical Commission; www.iec.ch.
102. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
103. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
104. IESNA - Illuminating Engineering Society of North America; (See IES).
105. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
106. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
107. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
108. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
109. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
110. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.

111. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
112. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
113. ISO - International Organization for Standardization; www.iso.org.
114. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
115. ITU - International Telecommunication Union; www.itu.int/home.
116. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
117. LMA - Laminating Materials Association; (See CPA).
118. LPI - Lightning Protection Institute; www.lightning.org.
119. MBMA - Metal Building Manufacturers Association; www.mbma.com.
120. MCA - Metal Construction Association; www.metalconstruction.org.
121. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
122. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
123. MHIA - Material Handling Industry of America; www.mhia.org.
124. MIA - Marble Institute of America; www.marble-institute.com.
125. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); www.wmmpa.com.
126. MPI - Master Painters Institute; www.paintinfo.com.
127. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
128. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
129. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
130. NADCA - National Air Duct Cleaners Association; www.nadca.com.
131. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
132. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
133. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
134. NCMA - National Concrete Masonry Association; www.ncma.org.
135. NEBB - National Environmental Balancing Bureau; www.nebb.org.
136. NECA - National Electrical Contractors Association; www.necanet.org.
137. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
138. NEMA - National Electrical Manufacturers Association; www.nema.org.
139. NETA - InterNational Electrical Testing Association; www.netaworld.org.
140. NFHS - National Federation of State High School Associations; www.nfhs.org.
141. NFPA - NFPA; (National Fire Protection Association); www.nfpa.org.
142. NFPA - NFPA International; (See NFPA).
143. NFRC - National Fenestration Rating Council; www.nfrc.org.
144. NHLA - National Hardwood Lumber Association; www.nhla.com.
145. NLGA - National Lumber Grades Authority; www.nlga.org.
146. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
147. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
148. NRCA - National Roofing Contractors Association; www.nrca.net.
149. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
150. NSF - NSF International; (National Sanitation Foundation International); www.nsf.org.
151. NSPE - National Society of Professional Engineers; www.nspe.org.

152. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
153. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
154. NWFA - National Wood Flooring Association; www.nwfa.org.
155. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
156. PDI - Plumbing & Drainage Institute; www.pdionline.org.
157. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
158. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
159. RFCI - Resilient Floor Covering Institute; www.rfci.com.
160. RIS - Redwood Inspection Service; www.redwoodinspection.com.
161. SAE - SAE International; (Society of Automotive Engineers); www.sae.org.
162. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
163. SDI - Steel Deck Institute; www.sdi.org.
164. SDI - Steel Door Institute; www.steeldoor.org.
165. SEFA - Scientific Equipment and Furniture Association; www.sefalabs.com.
166. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
167. SIA - Security Industry Association; www.siaonline.org.
168. SJI - Steel Joist Institute; www.steeljoist.org.
169. SMA - Screen Manufacturers Association; www.smainfo.org.
170. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
171. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
172. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
173. SPIB - Southern Pine Inspection Bureau; www.spib.org.
174. SPRI - Single Ply Roofing Industry; www.spri.org.
175. SRCC - Solar Rating and Certification Corporation; www.solar-rating.org.
176. SSINA - Specialty Steel Industry of North America; www.ssina.com.
177. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
178. STI - Steel Tank Institute; www.steel tank.com.
179. SWI - Steel Window Institute; www.steelwindows.com.
180. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
181. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
182. TCNA - Tile Council of North America, Inc.; (Formerly: Tile Council of America); www.tileusa.com.
183. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
184. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
185. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
186. TMS - The Masonry Society; www.masonrysociety.org.
187. TPI - Truss Plate Institute; www.tpinst.org.
188. TPI - Turfgrass Producers International; www.turfgrassod.org.
189. TRI - Tile Roofing Institute; www.tilerroofing.org.

190. UBC - Uniform Building Code; (See ICC).
191. UL - Underwriters Laboratories Inc.; www.ul.com.
192. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
193. USAV - USA Volleyball; www.usavolleyball.org.
194. USGBC - U.S. Green Building Council; www.usgbc.org.
195. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
196. WASTEC - Waste Equipment Technology Association; www.wastec.org.
197. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
198. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
199. WDMA - Window & Door Manufacturers Association; www.wdma.com.
200. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); www.wicnet.org.
201. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).
202. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
203. WPA - Western Wood Products Association; 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. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. 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; <http://dodssp.daps.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.
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; <http://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; 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. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeia; 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.gpo.gov/fdsys.
2. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; <http://dodssp.daps.dla.mil>.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from Department of Defense Single Stock Point; <http://dodssp.daps.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/ccb.
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).

E. State 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. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBHF - State of California; Department of Consumer Affairs; Bureau of Electronic Appliance and Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. CCR - California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS - California Department of Health Services; (See CDPH).
4. CDPH - California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
5. CPUC - California Public Utilities Commission; www.cpuc.ca.gov.

6. SCAQMD - South Coast Air Quality Management District; www.aqmd.gov.
7. TFS - Texas Forest Service; Forest Resource Development and Sustainable Forestry; <http://txforestservation.tamu.edu>.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 014500 – PROJECT REQUIREMENTS

PART 1 - GENERAL

1.1 PROJECT REQUIREMENTS

- A. General: This Section identifies Project Requirements and defines terms not otherwise included in the remainder of the Construction Documents.

1.2 SUPERVISION AND CONSTRUCTION PROCEDURES

- A. The Contractor shall coordinate the work of the various trades required for the project to assure the efficient and orderly sequence of installation of construction elements. The Contractor will verify that characteristics of interrelated equipment are compatible, and shall coordinate the work of various trades having interdependent responsibilities for installing, connecting and placing equipment in service.
- B. The Contractor and each Subcontractor will verify all new and existing dimensions for all built-in work and/or work adjoining that of other trades, before ordering any material or doing any work. They will be responsible for the correction of all dimensions found to be in error. Any discrepancy in dimensioning will be submitted, in writing, to the Architect for his consideration, before proceeding with the Work.
- C. The Contractor will notify “Call Before You Dig,” at least three (3) full working days before any proposed excavation activity. The Contractor will provide the Architect with written evidence of a Dig Number and Start Date prior to commencing any excavation work. The Contractor will have full responsibility for maintaining and protecting original utility mark-outs and for periodically notifying “Call Before You Dig” in accordance with State requirements. Should the Contractor require additional mark-outs as a result of the Contractor’s failure to adequately protect the original mark-outs, the Contractor will bear the cost for those additional mark-outs.
- D. The Contractor will satisfy himself regarding the accuracy of the base lines, benchmarks, etc., established by the Land Surveyor. He will protect all such stakes and/or marks as required to hold them free from damage or displacement, until they are no longer needed, or to the Date of Substantial Completion.

1.3 SPECIAL PROCEDURES FOR THE PROJECT

- A. “Plan of Use”: **If requested by the Owner** the Contractor shall prepare a “Plan of Use” for the Project which shall describe in detail the Contractor’s proposed use of the Site, both inside and outside the Contract Limit Area. The “Plan of Use” shall include, but not be limited to, the following: phasing of the project, including coordination and interaction with the Owner, allowances for Owner mobilization between phases, proposed vehicle and equipment access

routes, locations of proposed storage areas, office trailer and dumpster locations, location of perimeter construction fencing and gates, other ground level protection measures around the Site, proposed pedestrian traffic flows around the Site and coordination with staging areas of other, concurrent projects at the Project Site. The Contractor shall submit the "Plan of Use" to the Architect for approval within seven (7) calendar days of the award of the first Contract for Construction, and Work on the Project shall not commence until an acceptable "Plan of Use" has been approved by the Architect and by the Owner. Any delay in the Project caused by the Contractor's failure to submit an acceptable "Plan of Use" shall not alter the Contractor's responsibility to complete the Work by the date of Substantial Completion as set forth in the remainder of the Documents.

- B. The Contractor shall protect persons entering and exiting the building and construction area from falling debris by any measures necessary, including the construction of temporary covered walkways.
- C. The Contractor shall protect the site and keep it in a clean and orderly condition. Construction debris will be cleaned up and disposed of daily. Existing site features scheduled to remain, including existing walks, driveways, parking lots, and planting and lawn areas are to be kept free of construction materials and debris.
- D. Any existing site conditions which are disturbed by construction activities shall be restored by the Contractor to their original condition at the Contractor's cost. The Architect shall judge the conditions to be restored by the Contractor and final payment will not be made until those conditions are restored.
- E. Weapons or Intoxicants: No person employed on this Project will bring intoxicants or any type of weapon onto the Site.
- F. Fraternalization of Harassment: The Contractor is advised to avoid personal contact and fraternization with, and to respect the rights and privacy of, adjacent building occupants and people visiting adjacent buildings or the construction site.
- G. Smoking: Smoking shall not be permitted on site.

1.4 SITE DOCUMENTS

- A. Contract Documents: The Contractor shall maintain at the Site one (1) clean copy of the Contract Documents (Drawings and Project Manual), Addenda, approved Shop Drawings, Change Orders, Change Directives, etc., in good order with up-to-date Project information, which will be available to the Architect and City Officials at all times.

1.5 MANUFACTURER'S INSTRUCTIONS

- A. When the Contract Documents require that installation of any part of the Work will comply with a manufacturer's printed instructions, the Contractor shall obtain and distribute copies of such instructions to parties involved in the installation, including one copy to the Architect.

1. Maintain one (1) complete set of instructions at the Site during installation and until the Date of Substantial Completion.
- B. The Contractor shall handle, install, connect, clean, condition and adjust products in strict accordance with such instructions, and in conformity with specified requirements.
 1. Should job conditions or specified requirements conflict with manufacturer's instructions, the Contractor shall consult with the Architect for further instructions.
 2. The Contractor will not proceed with the Work without clear instructions.
- C. The Contractor shall perform all Work in accordance with the manufacturer's instructions. Do not omit any preparatory step or installation procedure unless it is specifically modified or deleted by the Contract Documents.

1.6 TRAFFIC WAYS

- A. The Contractor may use on-site paved roads and parking areas, as approved by the Owner, but will not block, encumber or otherwise obstruct the same. Public roadways will not be blocked by standing trucks, parked cars, material storage, and construction operations or in any other manner. The Owner will designate an area(s) within or outside of the Contract Limit Lines in which construction vehicles, dumpsters, etc., may be located, which shall be incorporated into the Contractor's "Plan of Use" per Article 1.3.A.
- B. The Contractor shall keep public roads and existing paved roads and driveways and parking areas on the Owner's property free of scrap or debris due to construction operations. The Contractor will repair, at the Contractor's expense, any damage to the surface of the roadways caused by the Contractor's construction operations.
- C. As the Work of the Contract affects public use of a street, road or highway, the Contractor shall confer with the police authority having jurisdiction to determine if and how many police are needed for public safety in addition to any barriers and signals that may be needed. The Contractor shall be responsible for payment of any required police or traffic control services, and shall include the cost of those services as part of the Base Contract.

1.7 TEMPORARY CONTROLS

- A. During the progress of the Work, the Contractor will conduct his operations and provide adequate pollution controls to minimize the creation and dispersion of noise, odors, dust, dirt, and/or mud within and beyond the Site. The controls will be implemented to the satisfaction of the Owner, to the extent required to assure the Owner's continued use of its remainder of the facilities on site.
- B. Should the Owner's use of its facilities be denied or interrupted by the failure of the Contractor to provide adequate controls, as specified above, the Contractor will be required to cease operations until adequate controls are provided. All costs incurred in such a cessation of operations will be borne by the Contractor. No extension of time will be granted due to such a cessation in operations.

1.8 CONSTRUCTION PHOTOGRAPHS/VIDEOTAPES

- A. ACES or the Architect may take progress photographs or videotapes at any time during the construction process. The Contractor will, at all times, allow unobstructed access to the Work for this purpose.

1.9 SIGNAGE

- A. If approved in writing by ACES, the Contractor may provide a Construction Sign. If so, all entities designated on the project cover sheet shall be listed with minimum 3-inch-high lettering.
- B. Contractor shall provide all OSHA required signage. Including but not limited to Authorized Personal Only, all warning signs, all informational signs as required.

1.10 REQUESTS FOR INFORMATION (RFI)

- A. Bidding and Construction Requests for Information are formal queries from the Contractor seeking interpretation of Construction Document requirements or information not otherwise available in the Construction Documents. RFIs shall clearly and concisely set forth the issue for which interpretation or information is sought, and why a response is needed from the Architect. RFIs shall describe the requesting party's understanding of the Contract Document requirement in question, along with reasons why this understanding has been reached. Responses from the Architect shall not change any requirements of the Contract Documents.
- B. Routine written communications between the Owner, the Architect and the Contractor shall be in letter or field memo format. Such communications shall not be identified as Requests for Information nor shall they substitute for any other written requirements pursuant to the provisions of these Contract Documents.
- C. In the event that the Contractor determines that some portion of the Contract Documents require interpretation or additional information by the Owner or Architect, the Contractor shall submit a Request for Information (RFI) in writing to the Architect. RFIs may only be submitted by the Contractor and not by Subcontractors, although Subcontractor correspondence may be attached by the Contractor to the RFI as supporting documentation.
- D. The Architect will review all RFIs to determine whether they are Requests for Information within the meaning of this term. If the Architect determines that the document is not an RFI, said document will be returned to the Contractor, unreviewed as to content, for resubmittal in the proper form and in the proper manner.
- E. RFIs shall be consecutively numbered. The Contractor shall maintain an RFI log for the duration of the Project. The Contractors log shall be distributed to the Architect and ACES on a weekly basis. Communications determined by the Architect not to be RFIs shall be removed from the log, and their assigned number re-used so that the log will reflect consecutive RFI numbers without gap.

- F. Responses to RFIs will be issued within fourteen (14) calendar days of receipt of the request from the Contractor, unless the Architect determines that a longer time is required to provide an adequate response. If a longer time is determined to be required by the Architect, the Architect will, within seven (7) calendar days of receipt of request, notify the Contractor of the anticipated response time. The Contractor shall not be allowed any time extensions on the project because of RFIs, unless the Architect is unable to provide a response within the allocated fourteen (14) calendar days.
- G. Responses from the Architect shall not change any requirements of the Contract Documents. In the event the Contractor believes that a response to an RFI will cause a change in the Construction Documents, the Contractor shall, within seven (7) calendar days, give written notice to the Architect stating that the response to the RFI will cause changes to the requirements of the Construction Documents. Failure to give such notice shall waive the Contractor's right to seek additional time or cost under the Contract Modification Procedures Article of these Specifications.

1.11 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

- A. Where discrepancies or conflict occur:
 - 1. Amendments and Addenda shall take precedence over the Specifications.
 - 2. The Specifications shall take precedence over the Drawings.
 - 3. Stated dimensions shall take precedence over scaled dimensions.
 - 4. Large-scale detail drawings shall take precedence over small-scale drawings.
 - 5. Schedules shall take precedence over other data on the drawings.
 - 6. In case of a difference between Drawings and Specifications or within either document itself in describing the Work, the better quality, greater quantity or costlier work will be assumed to be desired and shall be included in the Contractor's Bid and in the Contract price. Refer the matter to the Architect's attention for resolution after the Contract is awarded.
- B. 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 "by others," or "not in contract (NIC)."
- C. Parties to the Contract shall not take advantage of any obvious error or apparent discrepancy in the Contract Documents. Notice of any 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.

1.12 COMMUNICATIONS TO THE ARCHITECT

- A. All Communications to the Architect shall be addressed to:

Paolo Campos, AIA, NOMA
Patriquin Architects, PC.

20 Grand Avenue
New Haven, CT 06513
Telephone: (203) 535-1688
Email: paolo@patriquinarchitects.com

1.13 CONFLICTING REQUIREMENTS

- A. In case of conflicts between Division 01 requirements and those requirements outlined in the Contract General and Supplementary Conditions, the most stringent requirement shall prevail.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 014500

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 Requirements:
 - 1. Section 012300 "Alternates" for products selected under an alternate.
 - 2. Section 012500 "Substitution Procedures" for requests for substitutions.
 - 3. 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 other manufacturers.

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 week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven 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 or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

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. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment furnished by Owner. 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. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

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 equivalent," "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 be considered, in accordance with provisions of Section 012500 "Substitution Procedures," unless otherwise indicated.
 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 be considered, in accordance with provisions of Section 012500 "Substitution Procedures," unless otherwise indicated.
 3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
 4. Manufacturers:

- a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
 - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed that complies with requirements. Requests for substitutions will be considered in accordance with provisions of Section 012500 "Substitution Procedures."
- 5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include the name of the manufacturer, provide the specified or indicated product or a comparable product as requested by Contractor in a request for substitution in accordance with provisions of Section 012500 "Substitution Procedures." 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 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 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. Construction layout.
2. Installation of the Work.
3. Cutting and patching.
4. Coordination of Contractor installation of Owner-furnished products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.

- B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 017700 "Closeout Procedures" for submitting final Project Record Documents with recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
3. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.
4. Section 078413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

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. Qualification Data: For professional engineer.
- B. Certificates: Submit certificate signed by professional engineer certifying that location and elevation of improvements comply with requirements.
- C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
 - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 - 3. Products: List products to be used for patching and firms or entities that will perform patching work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

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 Architect before proceeding. Shore, brace, and support structural elements 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. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- C. 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 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 the Work, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of water-service piping and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- 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. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

2. Examine walls, floors, ceilings, and roofs for suitable conditions where products and systems are to be installed.
 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
1. Description of the Work.
 2. List of detrimental conditions, including substrates.
 3. List of unacceptable installation tolerances.
 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and to Owner that is necessary to adjust, move, or relocate existing utility structures, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. 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.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings. If discrepancies are discovered, notify Architect promptly.

3.4 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, wiring, and other services 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. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. 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.
- H. 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.
- I. 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.

- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 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. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. 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.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- G. 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. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.

5. 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.
 6. Proceed with patching after construction operations requiring cutting are complete.
- H. 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.
 - c. 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.
 3. Ceilings: Support existing light fixtures and provide protection to light fixtures during removal of existing ceiling panels and ceiling panel grid.
 4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 3. Containerize unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

- a. Use containers intended for holding waste materials of type to be stored.
 - 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 017419 "Construction Waste Management and Disposal."
 - 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.
- 3.7 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."

3.8 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.

END OF SECTION 017300

SECTION 017310 – CUTTING AND PATCHING

PART 1 - GENERAL

1.1 INCLUDED IN THIS SECTION

- A. General cutting and patching.
- B. Specific cutting and patching requirements.

1.2 CUTTING AND PATCHING - GENERAL

- A. Contractor shall be responsible for any alteration of existing work and cutting, patching of work as required by the installation of materials or performance of labor in contract.
- B. Match existing products and work for patching and extending work.
 - 1. New materials as specified in individual sections.
 - 2. Determine type and quality of existing products by inspection and any necessary testing, and workmanship by use of existing as a standard. Presence of a product, finish, or type of work, requires that patching, extending, or matching shall be performed as necessary to make work complete and consistent with specifications.
 - 3. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent new finishes.
- C. Do not cut structural members without first consulting and/or review intended procedures with Engineer. Contractor shall keep a written record of consulting and distributed this information to all relevant parties prior to proceeding. If the situation is of an unforeseen condition, prior to proceeding the Contractor shall submit a written Request for Information (RFI) to the Architect.
- D. Protect existing items.
- E. Bid Package Contractors are responsible for any cutting, coring and patching in the performance of their work due to the lack of installing sleeves or blocking in walls, floors or foundations.
 - 1. Remove, cut and patch work in a manner to minimize damage and to provide means of restoring products and finishes to original or specified condition.
- F. Transitions
 - 1. Where new work abuts or aligns with existing, make a smooth and even transition. Patched work shall match existing adjacent work in texture and appearance.
 - 2. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

3. When finished, surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendations to Architect.

PART 2 - PRODUCTS

2.1 SUBMITTALS

- A. Schedule: Submit schedule indicating proposed methods and sequence of operations for cutting and patching work to Owner's Representative for review prior to commencement of work. Include coordination for shut-off, capping, and continuation of utility services as required, together with details for dust and noise control protection.
- B. Provide detailed sequence of cutting and patching and removal work to ensure uninterrupted progress of Owner's on-site operations.

2.2 JOB CONDITIONS

- A. Protections: Provide temporary barricades and other forms of protection as required to protect Owner's personnel and general public from injury due to cutting and patching work.
 1. Provide protective measures as required to provide free and safe passage of Owner's personnel and general public to and from building.
 2. Erect temporary covered passageways as required by authorities having jurisdiction.
 3. Provide interior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished, and adjacent facilities or work to remain.
 4. Protect from damage existing finish work that is to remain in place and becomes exposed during cutting and patching operations.
 5. Protect finished floors with suitable coverings.
 6. Construct temporary fire-rated and insulated solid dustproof partitions to separate work area from the remainder of the school complex.
 7. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces, and installation of new construction to insure that no water leakage or damage occurs to structure or interior areas of existing building.
 8. Remove protections at completion of work.
- B. Damages: Promptly repair damages caused by cutting and patching work at no cost to Owner.
- C. Traffic: Conduct cutting and patching operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close, block or otherwise obstruct streets, walks or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

- D. Explosives: Use of explosives will not be permitted.
- E. Utility Services: Maintain existing utilities to remain, keep in service, and protect against damage during cutting and patching operations.
- F. Environmental Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Prior to commencement of cutting and patching work, inspect areas in which work will be performed. Photograph existing conditions to structure, surfaces, equipment or to surrounding properties which could be misconstrued as damage resulting from cutting and patching work. Submit these documents to the Architect prior to starting work.

3.2 PREPARATION

- A. Provide interior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain. Cease operations and notify the Owner's Representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.
- B. Cover and protect furniture, equipment and fixtures to remain from soiling or damage when cutting and patching work is performed in rooms or areas from which such items have not been removed.
- C. Erect and maintain dust-proof partitions and closures as required to prevent spread of dust or fumes.
- D. Provide weatherproof closures for exterior openings resulting from cutting and patching work.
- E. Locate, identify, stub off and disconnect utility services that are not indicated to remain. Provide by-pass connections as necessary to maintain continuity of service, if required. Provide minimum of seventy-two (72) hours advance notice to Owner if shut-down of service is necessary during change-over.

3.3 CUTTING AND PATCHING

- A. Perform removal, relocation and cutting and patching work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with cutting and patching schedule and governing regulations.

1. Demolish masonry in small sections. Cut masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.
 2. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.
 3. For interior work, use removal methods that will not crack or structurally disturb adjacent floors or partitions.
- B. If unanticipated mechanical, electrical or structural elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Architect in written, accurate detail. Pending receipt of directive from Architect rearrange cutting and patching schedule as necessary to continue overall job progress without delay.
- 3.4 DISPOSAL OF DEMOLISHED MATERIALS
- A. Remove debris, rubbish and other materials resulting from cutting and patching operations from building site. Transport and legally dispose of materials off site.
 - B. If hazardous materials are encountered during cutting and patching operations, comply with applicable regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution.
 - C. Burning of removed materials is not permitted on project site.
- 3.5 CLEAN-UP AND REPAIR
- A. Upon completion of cutting and patching work, remove tools, equipment and demolished materials from site. Remove protections and leave interior areas broom clean.
 - B. Repair cutting and patching performed in excess of that required. Return structures and surfaces to remain to condition existing prior to commencement of cutting and patching work. Repair adjacent construction or surfaces soiled or damaged by cutting and patching work.

END OF SECTION 017310

PART 1 - SECTION 017400 - WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.
 - 1. Refer to the General Conditions for terms of the Contractor's special warranty of workmanship and materials.
 - 2. General closeout requirements are included in Section 017700 "Closeout Procedures".
 - 3. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
- B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.2 DEFINITIONS

- A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.3 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its

anticipated useful service life.

- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
 - 1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
 - 2. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.4 SUBMITTALS

- A. Submit written warranties to the Engineer at the time of Substantial Completion. The start date of all project warranties shall be the date of Substantial Completion for the Project.
- B. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Architect for approval prior to final execution.
- C. Form of Submittal: At Final Completion compile two (2) copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 017400

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

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. Recycling nonhazardous demolition and construction waste.
 - 2. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
 - 1. Section 024119 "Selective Demolition" for disposition of waste resulting from partial demolition of buildings.
 - 2. Section 028213 "Asbestos Abatement Specifications" for disposal of waste resulting from removal of contaminated building materials and components.
 - 3. Section 028416 "Handling of Lighting Ballasts and Lamps Containing PCBs and Mercury" for disposal of fluorescent lighting components.
 - 4. Section 040120.63 "Brick Masonry Repair" for disposal requirements for masonry waste.

1.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

1.4 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 7 days of date established for Notice of Award.

1.5 INFORMATIONAL SUBMITTALS

- A. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- B. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan.
 - 2. Review requirements for documenting quantities of each type of waste and its disposition.
 - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - 5. Review waste management requirements for each trade.

1.7 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification. Distinguish between demolition and construction waste.
- B. Waste Identification: Indicate anticipated types and quantities of demolition and construction waste generated by the Work. Use Form CWM-1 for construction waste and Form CWM-2 for demolition waste.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 - 1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
 - 1. Distribute waste management plan to everyone concerned within three days of submittal return.
 - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be recycled.
 - 2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.3 RECYCLING DEMOLITION WASTE

- A. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- B. Metals: Separate metals by type.
 1. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- D. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
- E. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.
- F. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- G. Conduit: Reduce conduit to straight lengths and store by type and size.

3.4 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 2. Polystyrene Packaging: Separate and bag materials.
 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.

4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

3.5 DISPOSAL OF WASTE

- A. General: Except for items or materials to be recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

- B. Burning: Do not burn waste materials.

- C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 017419

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. Electronic copies of Construction Progress photographs
 - 4. Warranties.
 - 5. Final cleaning of the Project including the Site.
 - 6. Demonstration and Training
 - 7. Attic stock.
 - 8. Operation and Maintenance Data Manuals
- B. Related Requirements:
 - 1. Section 012900 "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
 - 2. Electronic copies of Construction Progress photographs
 - 3. Section 017300 "Execution" for progress cleaning of Project site.
 - 4. Sections referenced in the Project Manual for specific closeout and special cleaning requirements for products of those Sections.

1.3 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - 6. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 7. Complete startup testing of systems.
 - 8. Submit test/adjust/balance records.
 - 9. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 10. Advise Owner of changeover in heat and other utilities.
 - 11. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- 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.

1.7 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
 1. Submit a final Application for Payment according to 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.
- 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.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit three (3) copies 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.
 1. Organize list of spaces in sequential order.
 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 Contractor.
 - d. Page number.

1.9 PROJECT RECORD DOCUMENTS

- A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.
- B. Record Drawings: Maintain and submit one (1) set of blue- or black-line white prints of Contract Drawings and Shop Drawings.
 - 1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.
 - 2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
 - 3. Mark important additional information that was either shown schematically or omitted from original Drawings.
 - 4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
 - 5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.
- C. Record Specifications: Submit one (1) copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
- D. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1.10 OPERATION AND MAINTENANCE MANUALS

- A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
1. Operation Data:
 - a. Emergency instructions and procedures.
 - b. System, subsystem, and equipment descriptions, including operating standards.
 - c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
 - d. Description of controls and sequence of operations.
 - e. Piping diagrams.
 2. Maintenance Data:
 - a. Manufacturer's information, including list of spare parts.
 - b. Name, address, and telephone number of Installer or supplier.
 - c. Maintenance procedures.
 - d. Maintenance and service schedules for preventive and routine maintenance.
 - e. Maintenance record forms.
 - f. Sources of spare parts and maintenance materials.
 - g. Copies of maintenance service agreements.
 - h. Copies of warranties and bonds.
- B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

- A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
1. Provide instructors experienced in operation and maintenance procedures.

2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
 3. Schedule training with Owner, through Architect, with at least ten (10) business days' advance notice.
 4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.
- B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:
1. System design and operational philosophy.
 2. Review of documentation.
 3. Operations.
 4. Adjustments.
 5. Troubleshooting.
 6. Maintenance.
 7. Repair.

3.2 ATTIC STOCK

- A. Extra Stock: The Contractor shall provide 5% extra stock for all finish materials provided, unless otherwise specified. Where extra stock is a fractional unit round off to the next highest unit of supply, i.e., full box. Deliver extra stock to place designated by the Owner.
- B. at Substantial Completion provide a complete list of attic stock items along with appropriate quantities. Where a percentage of attic stock items are specified, convert the percentages to actual numbers.

3.3 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, of rubbish, waste material, litter, and other foreign substances.

- b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - j. Remove labels that are not permanent.
 - k. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - n. Clean blowers and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - o. Clean light fixtures, lamps, and reflectors to function with full efficiency.
 - p. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

END OF SECTION 017700

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. Demolition and removal of selected site elements.
3. Removal of existing items to be reused.

- B. Related Requirements:

1. Section 011000 "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 017300 "Execution" for cutting and patching procedures.
3. Section 028213 "Asbestos Abatement"
4. Section 028416 "Handling of Lighting Ballasts and Lamps Containing PCBs and Mercury"

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- C. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 PREINSTALLATION MEETINGS

- A. Predemolition 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 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.
- C. Predemolition Photographs: Submit before Work begins.

1.7 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: To the best of the Architect's knowledge, information, and belief, it is not expected that hazardous materials will be encountered in the Work.
- 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.

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 ANSI/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. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- D. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
 - 1. Comply with requirements specified in Section 013233 "Photographic Documentation."
 - 2. Inventory and record the condition of items to be removed and reused. Provide photographs 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.
 - 1. Comply with requirements for existing services/systems interruptions specified in Section 011000 "Summary."
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Arrange to shut off indicated utilities with utility companies.

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 plumbing, equipment, and components indicated 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.
 - 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.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."
- B. Temporary Facilities: 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. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 3. Cover and protect equipment that has not been removed.
 4. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: 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.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."

B. 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.

C. 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 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, then remove masonry between saw cuts.
- B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, 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." Do not use methods requiring solvent-based adhesive strippers.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused or reinstalled, remove demolished materials from Project site and legally dispose of them.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - 4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- 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 02 82 13 – ASBESTOS ABATEMENT**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. General Provisions of Contract, including General Supplementary Conditions shall apply to this Section.
- B. Fuss & O’Neill EnviroScience, LLC (EnviroScience) Limited Hazardous Materials Inspection Report dated November 2, 2016.
- C. Handling of Lighting Ballasts and Lamps Containing PCBs and Mercury Section 02 84 16
- D. Hazardous Materials Abatement Drawing HM-001.

1.2 CONSULTANT

- A. The Owner shall retain a Consultant for the purposes of project management and monitoring during Asbestos Abatement activities. At the discretion of the Owner, the Consultant will represent the Owner during the abatement project. The Asbestos Abatement Contractor (the “Contractor”) will regard the Consultant's direction as authoritative and binding as provided herein, in matters particularly, but not limited to the following:
 - 1. Approval of work areas
 - 2. Review of monitoring results
 - 3. Completion of the various segments of work
 - 4. Final completion of the abatement
 - 5. Submission of data
 - 6. Daily field punch list items
- B. The State of Connecticut-licensed Asbestos Consultant – Project Designer for this project is Eric Cooley (License No. 0000305).

1.3 SCOPE OF WORK

- A. Work outlined in this Section includes all work necessary for the removal, packaging, transporting, and disposing of asbestos-containing materials (ACM) and Asbestos impacted during the 300 Washington Street Renovation (the “Work”) at 300 Washington Street, Middletown, Connecticut (the “Site”). This Work under this Contract includes, but is not limited to asbestos abatement in the two story addition and connection hallway.
- B. This scope of work does not include asbestos abatement in church building.

1.4 USE OF THE CONTRACT DOCUMENTS

- A. It shall be incumbent upon the Contractor to visit the Site and determine what exists, its condition, and what will be required to accomplish the Work intended by the Contract Documents. No increase in the Contract Sum will be permitted as a result of the Contractor's failure to visit the Site and understand the existing conditions.
- B. All work shall comply with the Contract Documents and with applicable codes, laws, regulations, and ordinances wherever applicable. The most stringent of all the foregoing shall govern the Work.
- C. It is not intended that the Specifications show every detail of the Work, but the Contractor shall be required to furnish within the Contract Sum all material and labor necessary for the completion of the Work in accordance with the intent of these Specifications.
- D. In case of ambiguity among the Contract documents, the more stringent requirement as determined by the Consultant shall prevail.
- E. The Work of this Contract includes making modifications as necessary, subject to approval by Owner in consultation with the Consultant to correct any conflicts.
- F. All items not specifically mentioned in the Specifications, but implied by trade practices to complete the Work, shall be included.

1.5 SITE EXAMINATION

- A. It is understood that the Contractor has examined the Site and made their own estimates of the facilities and difficulties attending the execution of the Work, and has based their price thereon.
- B. Except for unforeseeable concealed conditions as determined by the Consultant, the Contractor shall make no claim for additional cost due to the existing conditions at the Site.

1.6 CONTRACTOR QUALIFICATIONS

- A. All bidders shall submit a record of prior experience in asbestos abatement projects, listing no less than three completed projects in the past year, with all projects of similar size and scope. The Contractor shall list the experience and training of the project foremen and all on-site personnel. The information that should be included is as follows:
 - 1. Project Name and Address
 - 2. Owner's Name and Address
 - 3. Architect/Consultant
 - 4. Contract Amount
 - 5. Date of Completion
 - 6. Extras and Changes

- B. The Contractor selected must appear on the approved list of Asbestos Abatement Contractors on file at the State of Connecticut Department of Public Health (CTDPH) and hold a valid license for asbestos abatement within the State of Connecticut.
- C. Submit a written statement regarding whether the Contractor has ever been cited for non-compliance with federal, state, or local asbestos and/or lead regulations pertaining to worker protection, removal, transport, or disposal.

1.7 TESTING LABORATORY SERVICES

- A. The Contractor shall submit to the Consultant the name; address and qualifications of proposed laboratories intended to be utilized for sample analysis as required by this Section.

1.8 ADDITIONAL GENERAL REQUIREMENTS

- A. The Contractor shall employ a competent CTDPH-licensed Asbestos Abatement Supervisor with at least three years of experience on projects of similar scope and magnitude who shall be responsible for all work involving asbestos abatement as described in the specifications and defined in applicable regulations, and have full-time daily supervision of the same. The Supervisor shall be the competent person as defined by Occupational Safety and Health Administration (OSHA) regulations.
- B. If required by federal, state, local, and any other authorities having jurisdiction over such work, the Contractor shall allow the work of this contract to be inspected. The Contractor shall immediately notify the Owner, Architect, and Consultant and shall maintain written evidence of such inspection for review by the Owner, Architect, and Consultant.
- C. The Contractor shall incur the cost of all fines resulting from regulatory non-compliance as issued by federal, state, and local agencies. The Contractor shall incur the cost of all work requirements mandated by federal, state, and local agencies as a result of regulatory non-compliance or negligence.
- D. The Contractor shall immediately notify the Owner, Architect and Consultant of the delivery of all permits, licenses, certificates of inspection, of approval, or occupancy, etc., and any other such instruments required under codes by authorities having jurisdiction, regardless of who issued, and shall cause them to be displayed to the Owner, Architect and Consultant for verification and recording.

1.9 PROJECT DESCRIPTION

- A. The base bid includes the removal, packaging, transporting, and disposing of all ACM as identified herein conducted by workers meeting the requirements of OSHA Title 29 CFR, Part 1926.1101 for Class 1 and 2 work. This shall include all necessary demolition to access the ACM for abatement.

B. Materials as discovered outside of those listed (either above or below) will be measured and paid or credited by unit prices. The quantities are estimates only and should be verified by the Contractor.

C. The base bid includes the following ACM:

BASE BID - ASBESTOS

LOCATION	MATERIAL TYPE	ESTIMATED QUANTITY	NOTES
North Corridor at Church Connection	Caulk, fillers and backer rod associated with Brick Connection Joint	20 LF	1, 2
1 st & 2 nd Floor Addition Stairwells & Foyers	Asbestos Core Fire Doors	8 Door Slabs (21 SF/Door)	1, 3
Rooms 105 & 106 at Sink Countertops	Adhesives and Caulk associated with Laminate Backsplash /Countertop	8 LF (4 SF)	1, 4
1 st & 2 nd Floor Addition Exterior Walls Throughout	Assumed Asbestos Containing Vapor Barrier Between Interior & Exterior Masonry Walls	Not Provided: Coordinate with General Contractor for Penetration Locations, Size & Quantity.	5

Notes:

1. Quantities shall be verified by Contractor during the time of the walk-through. Discrepancies of amounts and/or locations of asbestos-containing materials shall be addressed prior to bidding the work to the Owner and Consultant.
2. All accessible materials associated with the masonry connection joint shall be removed to a clean substrate and disposed of as asbestos, including, but not limited to, caulk, putty, filler, backer rod, etc. The Joint shall be re-caulked using an asbestos free, flexible expansion joint caulk.
3. Fire door core and associated window glazing compound are asbestos-containing material. Doors shall be removed, wrapped in 2 layers of 6 mil poly sheeting, labeled and disposed of as asbestos.
4. Laminate backsplash/countertop adhesive is asbestos containing material. Remove laminate countertop/backsplash and all associated adhesive down to a clean substrate and dispose of as asbestos. If the sink is to be salvaged, clean any adhesive off of the countertop, clean and save for general contractor.
5. A Vapor barrier between interior and exterior masonry walls is assumed to be present and Asbestos Containing. Abatement contractor to coordinate with the general contractor to conduct all drilling and coring through the exterior masonry walls as identified in the mechanical drawings.

- D. Some of the Work will be performed in multiple mobilizations, at different periods of time, in conjunction with other trades (i.e., other trades work, demolition work, etc.).
- E. Safety Data Sheets (SDS) for chemicals to be used during the project must be submitted to the Consultant prior to site delivery.
- F. Encapsulants applied to any surface that will receive a new finish that requires an adhesive must be compatible with the application of the new finish.
- G. The Contractor shall be responsible for providing temporary water, power, and heat as needed at the Site to perform the work required. Temporary lighting within the work areas must be connected to Ground Fault Circuit Interrupter (GFCI) power panels installed by a State of Connecticut-licensed electrician, permitted as required, and located outside of the work areas.

1.10 DEFINITIONS

- A. The following definitions relative to asbestos abatement apply:
 - 1. Abatement: Procedures to control fiber release from ACM; includes removal, encapsulation, and enclosure.
 - 2. Air Monitoring: The process of measuring the total airborne fiber concentration of an area, or a person.
 - 3. Amended Water: Water to which a surfactant (wetting agent) has been added.
 - 4. Architect: Patriquin Architects
 - 5. Asbestos: The name given to a number of naturally occurring fibrous silicates. This includes the serpentine forms and the amphiboles, and includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite, or any of these forms, which have been chemically-altered.
 - 6. Asbestos Felt: A product made by saturating felted asbestos with asphalt, or other suitable bindery, such as a synthetic elastomer.
 - 7. Asbestos Fibers: Those particles with a length greater than five (5) microns and a length to diameter ratio of 3:1 or greater.
 - 8. Asbestos Project Designer: The State of Connecticut-licensed Asbestos Consultant – Project Designer for this project is Eric Cooley (License No. 000305).
 - 9. Asbestos Work Area: A regulated area as defined by OSHA Title 29 CFR, Part 1926.1101 where asbestos abatement operations are performed, which is isolated by physical barriers to prevent the spread of asbestos dust, fibers, or debris. The regulated area shall comply with requirements of regulated area for demarcation, access, respirators, prohibited activities, competent persons and exposure assessments and monitoring.
 - 10. Caulking: Resilient mastic compound often having a silicone bituminous or rubber base; used to seal cracks, fill joints, and prevent leakage. Typical applications: around windows, and doors. Caulking is at joints between two dissimilar materials. (i.e., masonry to wood, masonry to steel).
 - 11. Clean Room: An uncontaminated area or room, which is a part of the worker decontamination enclosure with provisions for storage of worker street clothes and protective equipment.

12. Clearance Sampling: Final air sampling performed aggressively after the completion of the abatement project in a regulated area. Air samples collected by the air sampling professional having a total airborne fiber concentration of less than 0.010 fibers per cubic centimeter of air (fibers/cc) in each of five (5) samples collected inside the containment will denote acceptable clearance sampling by Phase Contrast Microscopy (PCM), or five air samples collected inside the containment by the air sampling professional having an average asbestos concentration of less than 70 structures per square millimeter (s/mm^2) of air will denote acceptable clearance sampling for Transmission Electron Microscopy (TEM).
13. Competent Person: As defined by OSHA Title 29 CFR, Part 1926.1101, a representative of the Abatement Contractor who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure. The Competent Person has authority to take prompt corrective measures, and to eliminate such hazards during asbestos removal. The Competent Person shall be properly trained in accordance with EPA's Model Accreditation Plan (MAP).
14. Consultant: Fuss & O'Neill EnviroScience, LLC: A company retained by the Owner with State of Connecticut-licensed asbestos designer and asbestos project monitors to provide services enumerated in this section during asbestos abatement.
15. Containment: An enclosure within the building which establishes a contaminated area and surrounds the location where ACM and/or other toxic or hazardous substance removal is conducted, and establishes a Control Work Area.
16. Curtained Doorway: A device to allow ingress and egress from one area to another while permitting minimal air movement between the areas. Two curtained doorways spaced a minimum of six feet apart can form an airlock.
17. Damproofing: Application of a water impervious material to surface (such as a wall) to prevent penetration of moisture, typically at foundation or below grade surface.
18. Decontamination Enclosure System: A series of connected areas, with curtained doorways between any two adjacent areas, for the decontamination of workers and equipment. A decontamination enclosure system always contains at least one airlock and is adjacent and connected to the regulated area, where possible.
19. Encapsulant: A liquid material which can be applied to ACM, which controls the possible release of asbestos fibers from the materials either by creating a membrane over the surface (bridging encapsulant), or penetrating the material and binding its components together (penetrating encapsulant).
20. Equipment Room: Any contaminated area or a room that is part of the worker decontamination enclosure with provisions for storage of contaminated clothing and equipment.
21. Fixed Object: Unit of equipment or furniture in the work areas that cannot be removed from the work area.
22. Friable Asbestos Materials: Any material that contains more than 1% asbestos by weight, that can be crumbled, pulverized or reduced to powder by hand pressure.
23. Glazing Compound: Any compound used to hold window glass in place, also referred to as putty, or glazier's putty. Is not field-applied, usually installed during manufacture of windows.
24. HEPA Filter: High Efficiency Particulate Air (HEPA) filter in compliance with ANSI Z9.2 1979.

25. HEPA Vacuum Equipment: Vacuum equipment fitted with a HEPA filter system for filtering the effluent air from the unit.
26. Movable Object: Unit of equipment of furniture in the work area that can be removed from the work area.
27. Negative Air Pressure Equipment: A portable local exhaust system equipped with HEPA filtration used to create negative pressure in a regulated area (negative with respect to adjacent unregulated areas), and capable of maintaining a constant, low velocity air flow into regulated areas from adjacent unregulated areas.
28. NESHAPs: National Emissions Standard for Hazardous Air Pollutants regulations enforced by the EPA.
29. Owner: ACES.
30. Permissible Exposure Limit (PEL): The maximum total airborne fiber concentration to which an employee is allowed to be exposed. The new limit established by OSHA Title 29 CFR, Part 1926.1101 is 0.1 fibers per cubic centimeter (fibers/cc) as an eight (8)-hour time-weighted average (TWA), and 1.0 fibers/cc averaged over a sampling period of 30 minutes as an Excursion Limit. The Contractor shall be responsible for maintaining work areas in a manner that this standard is not exceeded.
31. Project Monitor: A professional capable of conducting air monitoring and analysis of schemes. This individual should be an industrial hygienist, an environmental scientist, or a Consultant with experience in asbestos air monitoring and worker protection equipment and procedures. This individual should have demonstrated proficiency in conducting air sample collection in accordance with OSHA Title 29 CFR, Parts 1910.1001 and 1926.1101.
32. RCRA: The Resource Conservation and Recovery Act (EPA Title 40 CFR, Parts 260 - 265).
33. Regulated Area: An area established by the employer to demarcate where Class I, II, and III asbestos work is conducted and any adjoining area where debris and waste from such asbestos work accumulate, and a work area within which total airborne fiber concentrations exceed, or there is a reasonable possibility that they may exceed the PEL.
34. Shower Room: A room between the clean room and the equipment room in the work decontamination enclosure with hot and cold running water and suitably arranged for employee showering during decontamination. The shower room is located in an airlock between the contaminated area and the clean area.
35. Totally Enclosed Manner: A manner that will ensure no exposure of human beings or the environment to a concentration of asbestos.
36. Transport Vehicle: A motor vehicle or rail car used for the transportation of cargo by any mode. Each cargo-carrying body (e.g., trailer, railroad freight car) is a separate transport vehicle.
37. Waterproofing: Material, usually a membrane or applied compound (tar/mastic), used to make a surface impervious to water, includes concealed conditions (applications around doors, windows, and in wall cavities). Sometimes combined with felts.

1.11 SUBMITTALS

- A. The Contractor shall submit the following to the Consultant in one complete package prior to the pre-construction meeting, and no later than 10 business days prior to the anticipated start of the Work:
1. Submit copies of all notifications, permits, applications, licenses, and like documents required by federal, state, or local regulations obtained or submitted in proper fashion.
 2. Submit a schedule to the Architect and the Consultant that defines a timetable for executing and completing the project, including work area preparations, removal, cleanup, decontamination, and final clearance air monitoring (if applicable).
 3. Submit the current valid State of Connecticut Asbestos Abatement Contractor license and certificate of insurance.
 4. Submit the name and address of the hauling contractor and landfill to be used. Also submit current valid operating permits and certificates of insurance for the transporter and landfill.
 5. Submit photographic or video documentation showing the building conditions prior to the start of work. The Contractor shall be held responsible for all damage to the building and its contents not shown on the pre-construction documentation.
 6. Submit the plans and construction details for the construction of the decontamination systems and the isolation of the work areas as may be necessary for compliance with this specification and applicable regulations.
 7. Submit the CTDPH license, training, medical, and respirator fit test records of each employee who may be on the Site.
 8. If the Contractor's CTDPH-licensed Asbestos Abatement Supervisor is not conducting OSHA-required employee exposure monitoring, submit the qualifications of the air sampling professional that the Contractor proposes to use for this project for this task.
 9. Submit detailed product information on all materials and equipment proposed for asbestos abatement work on this project. This includes Material Safety Data Sheets (MSDS) on all products and chemicals that may be used on the project.
 10. Submit pertinent information regarding the qualifications of the Project Supervisor (competent person) for this project, as well as a list of past projects completed.
 11. Submit a chain-of-command for the project.
 12. Submit a site-specific Emergency Action Plan for the project. The Plan may include emergency procedures to be followed by Contractor personnel to evacuate the building, hospital name, phone number, and most direct transportation route from the Site, emergency telephone numbers, etc.
 13. Submit a written site-specific Respiratory Protection Program for employees for the Work, including make, model and National Institute of Occupational Safety and Health (NIOSH) approval numbers of respirators to be used at the Site (if applicable).
 14. Proposed electrical safeguards to be implemented by a qualified Electrical Contractor, including but not limited to: location of transformers, GFCI outlets, lighting, and power panels necessary to safely perform the project, including a description of electrical hazards and a safety plan for common practices in the work area. This may also include safety plan for temporary lighting, extension cord and other powered equipment used in the work area (locations, daily inspections, etc.).

15. Submit the proposed worker orientation plan that at a minimum includes a description of asbestos hazards and abatement methodologies, a review of worker protection requirements, and the outline of safety procedures.
16. No work on the Site will be allowed to begin until the Owner/Architect and the Consultant as listed herein approve the Pre-Construction Submittals. Any delay caused by the Contractor's refusal or inability to submit this documentation in a timely manner does not constitute a cause for change order or a time extension;

B. The Contractor shall submit the following to the Consultant during the Work:

1. Copies of personal air sampling results (Consultant will not review or provide any direction or advice regarding results). The Contractor shall be responsible for proper sample analytical review and personal protective equipment (PPE) selection and use. Records are retained solely for project record.
2. Copies of training, Connecticut Licenses, fit test records, and medical records for new employees to start work (24-hours in advance) and prior to the new employee arriving at the Site.
3. Carbon copies from waste shipment record, waste manifest records, bill of lading or other waste tracking record for all specified materials.
4. Copies of daily log sheets, daily sign-in sheets, and containment sign-in sheets.

C. The Contractor shall submit the following to the Consultant at the completion of the Work. The Owner reserves right to retain payment(s) until all items are received in completion:

1. Original final completed copies of the waste shipment records, signed by all transporters and the designated disposal site owner/operator.
2. Original final completed copies of bill of lading, weight tickets, recycling tickets, and manifests for all specified materials.
3. Contractor's logs (daily activity logs, daily sign in sheets, containment sign-in sheets), and all worker training, Connecticut Licenses, medical records and respirator fit test records.
4. Copies of all OSHA personal monitoring results.

1.12 REGULATIONS AND STANDARDS

A. The Contractor shall be solely responsible for conducting this project and supervising all work in a manner that will be in conformance with all federal, state, and local regulations and guidelines pertaining to asbestos abatement. Specifically, the Contractor shall comply with the requirements of the following:

1. EPA National Emissions Standards for Hazardous Air Pollutants (NESHAPS) Regulations (Title 40 CFR, Part 61, Subpart M);
2. EPA Asbestos Hazards Emergency Response Act (AHERA) Regulations (Title 40 CFR, Part 763, Subpart E);
3. OSHA Asbestos Regulations (Title 29 CFR, Parts 1910.1001 and 1926.1101); and
4. Department of Transportation (DOT) Hazardous Waste Transportation Regulations (Title 49 CFR, Parts 170 – 180).

5. Connecticut Department of Energy and Environmental Protection (CTDEEP) Regulations (Section 22a-209-8(i) and Section 22a-220 of the Connecticut General Statutes);
6. CTDPH Standards for Asbestos Abatement (Sections 19a-332a-1 to 19a-332a-16);
7. CTDPH Licensing and Training Requirements for Persons Engaged in Asbestos Abatement and Asbestos Consultant Services (Sections 20-440-1 to 20-440-9 and Section 20-441);
8. 2003 International Building Code as adopted by the 2005 State of Connecticut Building Code including the 2009, 2011, 2013, and 2016 amendments;
9. Life Safety Code, National Fire Protection Association (NFPA);
10. Local health and safety codes, ordinances or regulations pertaining to asbestos remediation and all national codes and standards including American Society of Testing and Materials (ASTM), American National Standards Institute (ANSI), and Underwriter's Laboratories (UL).

1.13 EXEMPTIONS

- A. Any deviations from these specifications require the written approval and authorization from the Owner and Consultant. Any deviations that may impact the bid cost shall be delineated with the bid for the Architect/Owner to review.
- B. Any modifications from the standard work practices identified in the CTDPH Standards for Asbestos Abatement, Sections 19a-332a-1 to 19a-332a-16 must be requested in writing and approved in writing by the CTDPH. The Consultant shall develop the Alternative Work Practice (AWP) application on behalf of the Owner. If the Contractor intends to request an AWP for this project, the nature of the AWP shall be disclosed in the bid documents and the cost savings associated with said AWP shall be provided for the Owner's consideration. An AWP shall not be filed without prior Owner's and Consultant's approval.

1.14 FINAL RE-OCCUPANCY AIR CLEARANCE

- A. Following the completion of the encapsulation phase of the work, the Consultant shall collect final re-occupancy clearance air samples inside the work area per CTDPH Standards for Asbestos Abatement (19a-332-1 to 19a-332-16).
- B. The Owner shall be responsible for payment of the sampling and analysis of the initial final air clearance samples only. The Contractor shall be responsible for payment of all costs associated with the collection and analysis of additional final clearance air samples if the first set of samples fail to satisfy the clearance criteria.
- C. Contractor shall not conduct demolition or other removal activities during final re-occupancy air clearance sampling.
- D. Exterior asbestos abatement work: Re-occupancy clearance air sampling is not required following removal of exterior non-friable ACM if removal does not render materials friable and negative pressure enclosures (NPEs) are not utilized. If removal renders non-friable materials friable, the Work must be performed within a NPE and final re-occupancy air clearance sampling will be conducted.

1.15 NOTIFICATIONS, POSTINGS, SUBMITTALS, AND PERMITS

- A. The Contractor shall make the following notifications and provide the submittals to the following agency prior to the start of work. This notification is required ten (10) calendar days prior to the start of the abatement project.
1. Connecticut Department of Public Health
410 Capitol Avenue
MS #51 AIR
P.O. Box 340308
Hartford, CT 06134-0308
- B. The minimum information included in the notification to these agencies includes:
1. Name and address of building Owner/Operator
 2. Building location
 3. Building size, age, and use
 4. Amount of asbestos to be removed
 5. Work schedule, including proposed start and completion date
 6. Asbestos removal procedures to be used
 7. Name and location of disposal site for generated asbestos waste, residue, and debris

1.16 WORK SITE SAFETY PLAN

- A. The Contractor shall establish a set of emergency procedures and shall post them in a conspicuous place at the Site. The safety plan should include provisions for the following:
1. Evacuation of injured workers.
 2. Emergency and fire exit routes from all work areas.
 3. Emergency first aid treatment.
 4. Local telephone numbers for emergency services including ambulance, fire, and police.
 5. A method to notify occupants of the building in the event of a fire or other emergency requiring evacuation of the building.
- B. The Contractor shall be responsible for training all workers in these procedures.

1.17 INDEPENDENT AIR SAMPLING AND ASBESTOS ABATEMENT MONITORING

- A. This Section describes independent air sampling work being performed on behalf of the Owner. This work is not in the Contract Sum. This Section describes air monitoring conducted by the Consultant to verify that the building beyond the work area and the outside environment remains uncontaminated. (Personal air monitoring required by OSHA is work to be performed by the Contractor and is within the Contract Sum). Negative exposure assessments will not be reviewed and/or approved by the Consultant. It shall be the Contractor's responsibility to determine its validity.

- B. The purpose of the Consultant’s air monitoring is to verify proper engineering controls in the work area:
 - 1. Contamination of the building outside of the work area by airborne fibers.
 - 2. Failure of filtration or rupture in the differential pressure system.
 - 3. Contamination of air outside the building envelope by airborne fibers.
- C. Should any of the above occur, the Contractor shall immediately cease asbestos abatement activities until the fault is corrected. Do not recommence work until authorized by the Consultant.
- D. The Consultant may monitor total airborne fiber concentrations in the work area. The purpose of this air monitoring will be to detect total airborne fiber concentrations, which may challenge the ability of the Work Area isolation procedures to protect the balance of the building or outside of the building from contamination by airborne fibers.
- E. To determine if the elevated total airborne fiber concentrations encountered during abatement operations have been reduced to an acceptable level, the Consultant will sample and analyze air in accordance with clearance air sampling requirements.
- F. The Consultant may perform on-site monitoring throughout the project, as follows:
 - 1. All work procedures shall be continuously monitored by the Consultant to assure that areas outside the designated work locations in the buildings will not be contaminated.
 - 2. Prior to work on any given day, the Contractor’s designated “competent person” shall discuss the day's work schedule with the Consultant to evaluate job tasks with respect to safety procedures and requirements specified to prevent contamination of the building or the employees. This includes a visual work area inspection and the building or the employee decontamination. This includes a visual inspection of the work area and the decontamination enclosure systems.

1.18 CONTRACTOR'S AIR SAMPLING RESPONSIBILITY

- A. The Contractor shall independently retain an air sampling professional or the CTDPH-licensed Asbestos Abatement Supervisor shall monitor total airborne fiber concentrations in the worker breathing zones, and to establish conditions and work procedures for maintaining compliance with OSHA Title 29 CFR, Parts 1910.1001 and 1926.1101.
- B. The Contractor’s air sampling professional shall document all air sampling results and provide a report to the Consultant within 48-hours after sample collection.
- C. All air sampling shall be conducted in accordance with methods described in OSHA Title 29 CFR, Parts 1910.1001 and 1926.1101.

1.19 PROPER WORKER PROTECTION

- A. This Section describes the equipment and procedures required for protecting workers against asbestos contamination and other workplace hazards except for respiratory protection.

- B. All workers are to be accredited as Abatement Workers as required by the EPA AHERA Title 40 CFR, Parts 763 Appendix C to Subpart E, February 3, 1994.
- C. The Contractor is required to be certified and accredited as required by CTDPH.
- D. In accordance with OSHA Title 29 CFR, Part 1926, all workers shall receive a training course covering the dangers inherent in handling asbestos, the dangers of breathing asbestos dust, proper work procedures, and proper worker protective measures. This course must include, but is not limited to the following:
1. Methods of recognizing asbestos
 2. Health effects associated with asbestos
 3. Relationship between smoking and asbestos in producing lung cancer
 4. Nature of operations that could result in exposure to asbestos
 5. Importance of and instruction in the use of necessary protective controls, practices and procedures to minimize exposure including:
 - a. Engineering controls
 - b. Work Practices
 - c. Respirators
 - d. Housekeeping procedures
 - e. Hygiene facilities
 - f. Protective clothing
 - g. Decontamination procedures
 - h. Emergency procedures
 - i. Waste disposal procedures
 6. Purpose, proper use, fitting, instructions, and limitations of respirators as required by OSHA Title 29 CFR, Part 1910.134
 7. Appropriate work practices for the work
 8. Requirements of medical surveillance program
 9. Review of OSHA Title 29 CFR, Part 1926
 10. Pressure Differential Systems
 11. Work practices including hands on or on job training
 12. Personal Decontamination procedures
 13. Air monitoring, personal and area
- E. The Contractor shall provide medical examinations for all workers who may encounter a total airborne fiber concentration of 0.1 fibers/cc or greater for an 8-hour TWA. In the absence of specific airborne fiber data provide medical examinations for all workers who will enter the work area for any reason. Examination shall, at a minimum, meet OSHA requirements as set forth in Title 29 CFR, Part 1926. In addition, provide an evaluation of the individual's ability to work in environments capable of producing heat stress in the worker.
- F. Submit the following to the Consultant for review. The Contractor shall not start work until these submittals are returned with Consultant action stamp indicating that they are approved.
1. Submit copies of certificates from an EPA approved AHERA Abatement Workers course for each worker as evidence that each asbestos Abatement Worker is accredited as

- required by the AHERA Regulation Title 40 CFR, Part 763 Appendix C to Subpart E, February 3, 1994.
2. Submit evidence that the Contractor is certified to perform asbestos abatement work by the CTDPH.
 3. Submit documents verifying that each worker has had a medical examination within the last 12 months as part of compliance with OSHA medical surveillance requirements. Submit, at a minimum, for each worker the following:
 - a. Name and Social Security Number (minimum last 4 digits)
 - b. Physician's written opinion from examining physician including at a minimum the following:
 - 1) Whether worker has any detected medical conditions that would place the worker at an increased risk of material health impairment from exposure to asbestos.
 - 2) Any recommended limitations on the worker or on the use of PPE such as respirators.
 - 3) Statement that the worker has been informed by the physician of the results of the medical examination and of any medical conditions that may result from asbestos exposure.
 4. Copy of information that was provided to physician in compliance with OSHA Title 29 CFR, Part 1926.
 5. Statement that worker is able to wear and use the type of respiratory protection proposed for the project, and is able to work safely in an environment capable of producing heat stress in the worker.
 6. Effective June 4, 2000, submit copies of certificates for the site supervisor and the workers issued by CTDPH.
- G. Submit certification signed by an officer of the abatement-contracting firm and notarized that exposure measurement, medical surveillance, and worker training records are being kept in conformance with OSHA Title 29 CFR, Part 1926.
- H. The Contractor shall maintain control of and be responsible for access to all work areas to ensure the following requirements:
1. Non-essential personnel are prohibited from entering the area.
 2. All authorized personnel entering the work area shall read the "Worker Protection Procedures" that are posted at the entry points to the enclosure system, and shall be equipped with properly fitted respirators and protective clothing.
 3. All personnel who are exiting from the decontamination enclosure system shall be properly decontaminated.
 4. Asbestos waste that is removed from the work area must be properly bagged and labeled in accordance with these Specifications. The surface of the bags shall be decontaminated. Asbestos waste removed from the NPE must be immediately transported off-site or immediately placed in locked, posted temporary storage on-site, and removed within 24-hours of the project conclusion.

5. Any material, equipment, or supplies that are removed from the decontamination enclosure system shall be thoroughly cleaned and decontaminated by wet cleaning and/or HEPA vacuuming of all surfaces.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name and product technical description.
- B. Damaged or deteriorating materials shall not be used and shall be removed from the premises. Material that becomes contaminated with asbestos shall be decontaminated or disposed as asbestos waste.
- C. Polyethylene (poly) sheeting in a roll size to minimize the frequency of joints shall be delivered to the Site with factory label indicating 6-mil.
- D. Poly disposable bags shall be 6-mil with OSHA-required pre-printed label (29 CFR, Part 1926.1101(k)(8)(iii)). Tie wraps for bags shall be plastic, five-inches long (minimum), pointed and looped to secure filled plastic bags.
- E. Tape or adhesive spray will be capable of sealing joints in adjacent poly sheets and for attachment of poly sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water.
- F. Surfactant (wetting agent), shall consist of 50 percent polyoxyethylene ether and 50 percent polyoxyethylene ester, or equivalent, and shall be mixed with water to provide a concentration of one ounce surfactant to five gallons of water or as directed by manufacturer.
- G. Removal encapsulant shall be non-flammable factory prepared penetrating chemical encapsulant deemed acceptable to Consultant. Usage shall be in accordance with manufacturer's printed technical data.
- H. The Contractor shall have available spray equipment capable of mixing wetting agent with water and capable of generating sufficient pressure and volume and having sufficient hose length to reach all areas with asbestos.
- I. Impermeable containers are to be used to receive and retain any asbestos-containing or contaminated materials until disposal at an acceptable disposal site. The containers shall be labeled in accordance with OSHA Title 29 CFR, Part 1926.1101(k)(8)(iii) [June 1, 2015 requirements]. Containers must be both air and watertight.
- J. Labels and signs, as required by OSHA Title 29 CFR, Part 1926.1101, will be used.
- K. Encapsulant shall be bridging or penetrating type which has been deemed acceptable to the Consultant. Usage shall be in accordance with manufacturer's printed technical data.

- L. HEPA filtered local exhaust ventilation shall be utilized during the installation of enclosures and supports where ACM may be disturbed.

2.2 TOOLS AND EQUIPMENT

- A. The Contractor shall provide all clean tools and equipment necessary for asbestos removal, encapsulation, and enclosure.
- B. The Contractor's air monitoring professional or Abatement Supervisor shall have air-monitoring equipment of type and quantity to monitor operations and conduct personnel exposure surveillance per OSHA requirements. The equipment shall function properly, and air samples shall be calibrated with a recently calibrated (within 6 calendar months) rotometer.
- C. The Contractor shall have available sufficient inventory or dated purchase orders for materials necessary for the job including protective clothing, respirators, filter cartridges, poly sheeting of proper size and thickness, tape and air filters.
- D. The Contractor shall provide (as needed) temporary electrical power panels, electrical power cables, and electrical power sources (such as generators). Any electrical connection work affecting the building electrical power system shall be performed by a State of Connecticut-licensed electrician.
- E. The Contractor shall be responsible for coordinating electrical and water services and shall pay for these services for the duration of the project, if applicable. .
- F. The Contractor shall assist the Consultant by providing necessary tools and equipment (e.g., coveralls, ladders, extension cords, lighting, etc.) for the Consultant to conduct inspections, final visual inspections, and final air clearance monitoring. The Consultant reserves the right to reject such items that are deemed unsafe and/or do not function properly and request items be replaced with adequate replacements. The work areas shall be safe to enter/occupy by the Consultant.
- G. The Contractor shall have available shower stalls and plumbing to support same to include sufficient hose length and drain system or an acceptable alternate.
- H. Exhaust air filtration system units shall contain HEPA filter(s) capable of sufficient air exhaust to create negative air pressure of -0.02 inches of water column within enclosure with respect to outside area. A manometer shall be supplied for all work areas. Equipment shall be checked for proper operation by smoke tubes or differential pressure gauge before the start of each shift and at least twice during the shift. Adequate exhaust air shall be provided for a minimum of four (4) air changes per hour within the NPE. The Contractor will have reserve units so that in the event of a unit failure, negative pressure may be promptly reestablished. No air movement system or air filtering equipment shall discharge unfiltered air outside.
- I. Vacuum units, of suitable size and capacities for the project, shall have HEPA filter(s) capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter or larger.

PART 3 - EXECUTION**3.1 PRE-CONSTRUCTION MEETING**

- A. At least one week prior to the start of work, a Pre-Construction meeting will be scheduled and must be attended by the Contractor and any Sub-Contractors. The assigned Contractor Site Supervisor must also attend this meeting.
- B. The Contractor shall present a detailed project schedule and project submittals at the Pre-Construction Meeting. Variations, amendments, and corrections to the presented schedule will be discussed, and the Owner and the Consultant will inform the Contractor of any scheduling adjustments for this project.
- C. Following the Pre-Construction meeting, the Contractor shall submit a revised schedule (if needed) no later than one week after the meeting.

3.2 WORK AREA PREPARATION FOR INTERIOR ABATEMENT

- A. Where necessary, deactivate electrical power, including receptacles and light fixtures. Under no circumstances during the decontamination procedures will lighting fixtures be permitted to be operating when amended water spray may contact the fixture. Provide GFCI devices, temporary power, and temporary lighting installed in compliance with the applicable electrical codes. All installations are to be made by a State of Connecticut-licensed electrician, permitted as required, and located outside the work areas.
- B. Temporary power shall be continuous power. Portable generators for use during asbestos abatement are not authorized.
- C. Deactivate and/or isolate heating, ventilating, and air conditioning (HVAC) air systems or zones to prevent contamination and fiber dispersal to other areas of the building or structure. During the work, vents within the work area shall be covered with two layers of 6-mil poly, and completely sealed with duct tape.
- D. The Contractor shall be responsible for removing furniture, equipment and any other materials to be salvaged from the work areas. Contractor shall be responsible for removing all solid waste within the work areas (if applicable). The Contractor shall pre-clean moveable objects within the proposed work areas using HEPA-filtered vacuum equipment and/or wet cleaning methods as appropriate and remove such objects from work areas. Non-porous materials (i.e., metal) shall be cleaned, visually inspected by a project monitor prior to removal from the work areas and recycling/disposal as solid waste.
- E. Completely seal all openings, including, but not limited to: windows, corridors, doorways, skylights, ducts, grills, diffusers, and any other penetration of the work areas, with poly sheeting a minimum of 6-mil thick, and sealed with duct tape. This includes doorways and corridors that will not be used for passage during work areas and occupied areas.

- F. Pre-clean fixed objects within the work areas, using HEPA vacuum equipment and/or wet cleaning methods as appropriate, and enclose with a minimum 6-mil poly sheeting completely sealed with duct tape.
- G. Clean the proposed work areas using HEPA vacuum equipment or wet cleaning methods as appropriate. Do not use methods that raise dust, such as dry sweeping or vacuuming with equipment not equipped with HEPA filters.
- H. After HEPA vacuum cleaning, cover fixed walls and floors.
- I. Install a ceiling consisting of at least one layer of 4 mil polyethylene sheeting, sealed with tape and glue to create a full containment enclosure.
- J. Maintain emergency and fire exits from the work areas, or establish alternate exits satisfactory to fire officials.
- K. Clean and remove ceiling mounted objects, such as lights and other items not sealed-off, which interfere with asbestos abatement. Use hand-held amended water spraying or HEPA vacuuming equipment during fixture removal to reduce settled fiber dispersal.
- L. Create pressure differential between work areas and uncontaminated areas by the use of acceptable negative air pressure equipment sufficient to provide four air changes per hour and create negative air pressure of -0.02 inches of water column within enclosure with respect to outside area as measured on a water gauge.

3.3 WORK AREA PREPARATION FOR EXTERIOR ABATEMENT

- A. Where necessary, deactivate electrical power, including receptacles and light fixtures. Under no circumstances during the decontamination procedures will lighting fixtures be permitted to be operating when amended water spray may contact the fixture. Provide GFCI devices, temporary power, and temporary lighting installed in compliance with the applicable electrical codes. All installations are to be made by a Commonwealth of Massachusetts-licensed electrician, permitted as required, and located outside the work areas.
- B. If applicable, temporary power must be continuous power.
- C. Deactivate and/or isolate heating, ventilating, and air conditioning (HVAC) air systems or zones to prevent contamination and fiber dispersal to other areas of the structure. During the work, vents within the work area shall be covered with two layers of 6-mil poly and completely sealed with duct tape.
- D. Completely seal all openings, including, but not limited to: windows, corridors, doorways, skylights, ducts, grills, diffusers, and any other penetration of the work areas, with poly sheeting a minimum of 6-mil thick, and sealed with duct tape.
- E. Install ground cover consisting of one layer of six-mil poly, extending out a minimum of 15 feet from the building foundation in work. Tape and glue ground cover to the building foundation.

3.4 DECONTAMINATION SYSTEM

- A. The Contractor shall establish contiguous to the work area, a decontamination system consisting of equipment room, shower room, and clean room, in series. The only access between contaminated and uncontaminated areas shall be through this decontamination enclosure. If it is not feasible to erect a contiguous decontamination system, the Contractor shall establish a remote decontamination unit in as close proximity to the work area as is feasible. For exterior work, the Contractor shall establish a remote decontamination system at the perimeter of the regulated work area.
- B. Access between rooms in the decontamination system shall be through double-flap curtained openings. The clean room, shower and equipment room within the decontamination enclosure, shall be completely sealed ensuring that the sole source of airflow through this area originates from uncontaminated areas outside the work area.
- C. The Contractor shall establish contiguous with the work area an equipment decontamination enclosure consisting of two totally enclosed chambers divided by a double-flapped curtained opening. This enclosure must be constructed so as to ensure no personnel enter or exit through this unit.
- D. Occupied areas and/or building space not within the work areas shall be separated from asbestos abatement work areas by means of airtight barriers.
- E. Construct the decontamination enclosure system with wood or metal framing, cover both sides with a double layer of 6-mil poly sheeting, completely sealed with spray adhesive, and taped at the joints.
- F. If a Consultant is retained for pre-abatement services, the Contractor and the Consultant shall visually inspect barrier several times daily to assure effective seal and the Contractor shall repair defects immediately.

3.5 ASBESTOS REMOVAL PROCEDURE - GENERAL

- A. The Contractor shall have a designated “competent person” on the Site at all times to ensure establishment of a proper enclosure system and proper work practices throughout project.
- B. Abatement work will not commence until authorized by the Consultant.
- C. The Contractor shall properly coordinate abatement work with other trades, new construction and Site use. The Contractor shall be responsible for addressing any concerns by the Owner and/or Consultant.
- D. With a fine mist, spray ACM with amended water using airless spray equipment or apply approved removal wetting agent to reduce the release of fibers during removal operation.
- E. To maintain indoor asbestos concentrations to the minimum, the wet asbestos must be removed in manageable sections. Material drop shall not exceed eight feet. For heights up to 15-feet, provide inclined chutes or scaffolding to intercept drop.

- F. Remove ACM as appropriate by standard methods. Fill disposal containers as removal proceeds; seal filled containers and clean containers before removal to equipment decontamination enclosure system. Wet clean each container thoroughly, double bag and apply caution label. Ensure that workers do not exit the work area through the equipment decontamination enclosure.
- 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 (wire brushes are prohibited). During this work, the surfaces being cleaned shall be kept wet.
- H. Remove and containerize all visible accumulations of asbestos-containing and/or asbestos-contaminated debris. During cleanup, utilize brooms, rubber dustpan, and rubber squeegees to minimize damage to floor covering.
- I. Sealed disposal containers, and all equipment used in the work area, shall be included in the cleanup and shall be removed from work areas via the equipment decontamination enclosure at an appropriate time in the cleaning sequence. All asbestos waste in 6-mil poly disposal bags shall be double-bagged in the equipment decontamination enclosure before removal from the Site.
- J. At any time during asbestos removal, should the Consultant suspect contamination of areas outside the work area(s), they shall cause all abatement work to stop until the Contractor takes the necessary steps to decontaminate these areas, and eliminate the causes of such contamination. Unprotected individuals shall be prohibited from entering suspected contaminated areas until air sampling and visual inspections certify decontamination.
- K. After completion of the initial final cleaning procedure including removal of the inner layers of poly sheeting, but prior to encapsulation, a pre-sealant inspection shall be conducted by the Consultant. The pre-sealant inspection shall verify that ACM and residual dust has been removed from the work area.

3.6 ASBESTOS REMOVAL PROCEDURES – CAULKING/ADHESIVE

- A. Prior to the removal of caulking, laminate countertop/backsplash and associated mastic, the Contractor shall ensure that work area preparation has been conducted in accordance with Sections 3.2 and 3.4 of this Specification.
- B. The Contractor shall wet the asbestos containing material with amended water or detergent solution, so that entire surface is wet. Do not allow to puddle or run off into other areas. If a detergent is used, use in strict accordance with manufacturer's instructions.
- C. The Contractor shall keep material continuously wet throughout removal operation.
- D. Remove caulking and adhesives using a manual or powered chipping/scraping tools. Continuously mist floor in area where machine is working with amended water, removal

encapsulant or detergent solution. Wet any debris generated as necessary to keep continuously wet.

- E. Remove caulks, adhesives and laminates and place in labeled disposal bags or drums.
- F. Coordinate with the general contractor to determine if the sinks are being re-used, and if so, verify that there is no adhesive on the countertop containing the sink. Clean and set aside for visual inspection by the hygienist.

3.7 ASBESTOS REMOVAL PROCEDURES – INTERIOR DOOR SLABS

- A. Prior to the removal of Door Slabs, the Contractor shall ensure that a regulated work area has been established and the floor below the work area is covered with 6-mil thick poly sheeting.
- B. Remove door slabs by unscrewing hinges from the jamb and wrapping doors into 2-layers of 6-mil poly sheeting, spray glued and duct taped at the seams, properly label and dispose of as asbestos.
- C. When the Consultant completes their final visual inspection in a satisfactory manner, Contractor shall remove protective poly drop cloths by rolling in all 4 corners of the poly sheets.

3.8 ASBESTOS CORING/DRILLING PROCEDURES – WALL PENETRATIONS

- A. All wall penetrations through exterior walls shall be conducted by the asbestos abatement contractor. Where feasible all penetrations shall be conducted from the exterior of the building.
- B. Prior to the removal coring, the Contractor shall ensure that a regulated work area has been established on both the inside and outside of the wall penetration location and the floor/ground below the work areas are covered with 6-mil thick poly sheeting.
- C. The Contractor shall wet the masonry material with amended water or detergent solution, so that entire surface is wet. Do not allow to puddle or run off into other areas. If a detergent is used, use in strict accordance with manufacturer's instructions.
- D. Drilling/coring operations shall be conducted using a dust collection shroud and HEPA vacuum to collect and dust/debris generated by the operation.
- E. Remove cores, barrier material/debris, and place in labeled disposal bags or drums.
- F. When the Consultant completes their final visual inspection in a satisfactory manner, Contractor shall remove protective poly drop cloths by rolling in all 4 corners of the poly sheets, and dispose of as asbestos.

3.9 CONSULTANT'S RESPONSIBILITIES

- A. Air sampling may be conducted by the Consultant to ascertain the integrity of the controls that protect the building from asbestos contamination. Independently, the Contractor shall monitor

air quality within the work area to ascertain the protection of employees, and to comply with OSHA regulations.

B. The Consultant's project monitor may collect and analyze air samples during the following period:

1. Abatement Period. If retained for this service, the Consultant's project monitor shall collect samples on a daily basis during the work period. A sufficient number of area samples shall be collected outside of the work area, at the exhaust of the negative pressure system, and outside of the building to evaluate the degree of cleanliness or contamination of the building during removal. At the discretion of the Asbestos Project Monitor, additional air samples may be collected inside the work area and decontamination enclosure system.

a. If the Consultant's Asbestos Project Monitor determines that the building air quality has become contaminated from the abatement project, they shall immediately inform the Contractor to cease all removal operations and implement a work stoppage clean-up procedure. The Contractor, via their Asbestos Abatement Contractor, shall conduct a thorough clean-up of the building areas designated by the Consultant. No further removal work may occur until the Asbestos Project Monitor has determined through air sample collection and analysis that the airborne fiber concentrations are at or below the CTDPH re-occupancy standard.

C. The Consultant's project monitor shall collect and analyze air samples during the following period:

1. Post-Abatement Period. If required, the Asbestos Project Monitor shall conduct air sampling following the final clean-up phase of the project, once the "no visible residue" criterion, as established by the Asbestos Project Monitor, has been met and the work area has been encapsulated by the Contractor. Five air samples shall be collected inside the work area utilizing aggressive methods to comply with the CTDPH Standards for Asbestos Abatement Section 19a-332a-12.

a. Final re-occupancy air clearance sampling shall be conducted by the Asbestos Project Monitor in accordance with the CTDPH requirements using one of the following methods:

- 1) Transmission Electron Microscopy (TEM) method with an average limit of less than 70 s/mm² of filter surface.
- 2) Phase Contrast Microscopy (PCM) with a total airborne fiber concentration limit of less than or equal to 0.010 fibers/cc.

D. The Owner shall be responsible for payment for the initial final clearance air sampling performance only. If the first set of samples fail to satisfy the re-occupancy criteria, the Contractor shall be responsible for payment of all costs associated with the additional final clearance air sampling and analysis.

E. The Asbestos Project Monitor shall provide continual evaluation of the air quality of the building during removal, using their best professional judgment in respect to the CTDPH

guideline of 0.010 fibers/cc, and the background air quality established during the pre-abatement period.

- F. Pre-abatement and abatement air samples shall be collected as required to obtain a volume of 1,200 liters. Samples shall be analyzed by PCM NIOSH 7400 Method.

3.10 CONSULTANT'S INSPECTION RESPONSIBILITIES

- A. The Consultant shall conduct inspections throughout the progress of the abatement project. Inspections shall be conducted to document the abatement work progress, as well as the procedures and practices employed by the abatement Contractor.

- B. The Consultant may perform the following inspections during the abatement activities:

1. Pre-commencement Inspection. Pre-commencement inspections shall be performed at the time requested by the Contractor. The Consultant shall be informed 12-hours prior to the time the inspection is needed. If deficiencies are noted during the pre-commencement inspection, the Contractor shall perform the necessary adjustments to obtain compliance.
2. Work Area Inspections. Work area inspections shall be conducted on a daily basis at the discretion of the Consultant. During the work inspections, the Consultant shall observe the Contractor's removal procedures, verify barrier integrity, monitor negative air filtration devices, assess project progress, and if deficiencies are noted, inform the abatement Contractor of specific remedial activities.

- C. The Consultant shall perform the following inspections during the abatement activities:

1. Pre-sealant Inspection. Upon the request of the Contractor, the Consultant shall conduct a pre-sealant inspection. The Consultant shall be informed 12-hours prior the time that the inspection is needed. The pre-sealant inspection shall be conducted after completion of the initial cleaning procedures, but prior to encapsulation. The pre-sealant inspection shall verify that all ACM and residual debris have been removed from the work area. If the Consultant identifies residual dust or debris during the pre-sealant inspection, the Contractor shall comply with the request of the Consultant to render the area "dust free".
2. Final Visual Inspection. Upon request of the abatement Contractor, the Consultant shall conduct a final visual inspection. Following the removal of the inner layer of poly sheeting, but prior to final air clearance, the Consultant shall conduct a final visual inspection inside the work area. If residual dust or debris is identified during the final inspection, the Contractor shall comply with the request of the Consultant to render the area "dust free".

3.11 RE-OCCUPANCY AIR CLEARANCE AIR TESTING

- A. After the visual inspection is completed and all surfaces in the abatement area have dried, the Consultant shall conduct final re-occupancy air clearance sampling. Aggressive air monitoring will be used. Selection of location and of samples shall be the responsibility of the Consultant. Air monitoring volumes shall be sufficient to provide a detection limit of 0.010 fibers/cc using PCM NIOSH Method 7400, or a detection limit of 70 s/mm² utilizing TEM analysis as required.

- B. Areas that do not comply with the Standard for Cleaning for Initial Clearance shall continue to be cleaned by, and at, the Contractor's expense until the specified Standard of Cleaning is achieved, as evidenced by results of air testing results, as previously specified. This shall include all Consultant-based costs.
- C. The Contractor shall properly schedule abatement work and other site activities at appropriate times and locations to prevent cross contamination and/or dust in areas where the Asbestos Project Monitor will conduct air sampling.

3.12 ASBESTOS DISPOSAL

- A. Asbestos-containing and/or asbestos-contaminated material disposal must be in compliance with requirements of, and authorized by the EPA, CTDEEP, and the State of Connecticut.
- B. Disposal approvals shall be obtained before commencing asbestos removal.
- C. A copy of approved disposal authorization shall be provided to the Owner and the Consultant, and any required federal, state, or local agencies.
- D. Copies of all fully-executed Waste Shipment Records (WSR) will be retained by the Consultant as part of the project file. The Contractor shall document the specific amount of waste on each WSR, portion/location of the Site building it was generated from, and the type of waste. Upon receipt of the ACM waste, the landfill operator will sign the WSR, and the quantity of asbestos debris leaving the Site, and arriving at the landfill is documented for the Owner.
- E. All asbestos debris shall be transported in covered, sealed vans, boxes, or dumpsters, which are physically isolated from the driver by an airtight barrier. All vehicles must be properly-licensed to meet DOT requirements.
- F. Any vehicles used to store or transport ACM will either be removed from the Site at night, or securely locked and posted to prevent disturbance.
- G. Any incident and/or accident that may result in spilling or exposure of asbestos waste outside the containment, on and off the property, and all related issues shall be the sole responsibility of the Contractor.

END OF SECTION 028213

SECTION 02 84 16 - HANDLING OF LIGHTING BALLASTS AND LAMPS CONTAINING PCBs AND MERCURY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION I GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.
- B. Related Information:
 - 1. Fuss & O'Neill EnviroScience, LLC (EnviroScience) Limited Hazardous Materials Inspection Report dated November 2, 2016.
 - 2. Hazardous Materials Abatement Drawing HM-001.

1.2 SUMMARY OF WORK

- A. The abatement scope of work is work necessary to facilitate existing lighting fixtures specified to be demolished as part of the renovation and abatement work at 300 Washington, Street two story addition and connecting corridor located in Middletown, Connecticut.
- B. Fluorescent Light Ballasts: Work of this Section includes, but is not necessarily limited to: all that is necessary for complete removal and disposal of PCB -containing ballasts listed in Table 1. Work shall be performed related to selective demolition work necessary to facilitate building renovations. Ballasts that are to be removed shall be recycled / disposed as non-PCB containing if they have "No PCBs" labels.
- C. Fluorescent Lamps and Mercury Equipment: Work of this Section includes, but is not necessarily limited to: all that is necessary for complete removal and disposal/recycling/reclamation of presumed mercury-containing fluorescent lamps and mercury equipment, which includes thermostats, switches, and devices that exist in the building interior to be renovated. Fluorescent lamps that are to be removed shall be recycled / disposed of as universal wastes.
- D. The renovation scope of work is specified elsewhere in these Contract Documents. The Contractor shall coordinate this Section with other Sections for the actual quantities of the work required. Only those ballasts on light fixtures proposed for demolition require removal.
- E. The Contractor shall be responsible for verification of actual quantities of the abovementioned items requiring removal and disposal. This verification shall include an on-site walk-through of the work areas and visually inspecting ballasts for the presence of labels indicating "No PCBs". Ballasts without a label indicating "No PCBs" shall be disposed / recycled as presumed PCB-containing.

HANDLING OF LIGHTING BALLASTS AND LAMPS CONTAINING PCBs AND MERCURY

TABLE 1

LOCATION	TYPE/MODEL	ESTIMATED QUANTITY
Throughout Two Story Addition and Connecting Corridor	PCB/DEHP- Light Ballasts	226
	Thermostats	20
	4' Mercury-Containing Light Tube	460
	Compact Fluorescent Lamp (CFL)	17

1.3 REGULATIONS AND STANDARDS

A. The following regulations and standards of federal and state agencies apply to the disposal of ballasts, and are made part of this Specification by reference.

1. Toxic Substance Control Act (TSCA) (Title 40 CFR, Part 761).
2. Comprehensive Environmental Response, Compensation, and Liability Act (Superfund Law).
3. Department of Transportation (DOT) Regulations - DOT regulation HM-181 regulates transportation of hazardous materials, including PCBs.
4. Occupational Safety and Health Administration (OSHA). OSHA regulates workers' safety and exposure to a variety of chemicals including PCBs.
5. Resource Conservation and Recovery Act (RCRA). RCRA regulates wastes which fail Toxic Characteristic Leaching Procedure (TCLP) and which contain PCBs at concentrations greater than 50 parts per million.

B. The following regulations and standards of federal and state agencies apply to the disposal of universal waste (fluorescent lamps), and mercury-containing equipment are made part of this Specification by reference.

1. EPA RCRA Regulations Title 40 CFR, Part 261, Subpart C.
2. EPA RCRA - 40 CFR Part 273.
3. Comprehensive Environmental Response, Compensation, and Liability Act (Superfund Law).
4. DOT Regulations – Pipeline and Hazardous Materials Safety Administration regulation DOT Title 49 CFR, Parts 100-185, as applicable.
5. OSHA Regulations Title 29 CFR, Parts 1910.1200 Hazard Communications and 1926.65.

1.4 PRE-CONSTRUCTION SUBMITTALS

A. The Contractor shall submit to the Hazardous Materials Consultant the following submittals prior to start of the Work:

1. Proposed transporter for PCB and non-PCB wastes generated as part of the project, including licenses as required, and insurance certificate.
2. Proposed disposal/recycling facility proposed for PCB and non-PCB waste generated as part of the project, operating permit, and insurance certificate.
3. Proposed transporter for mercury-containing universal wastes generated as part of the project, including licenses as required.

HANDLING OF LIGHTING BALLASTS AND LAMPS CONTAINING PCBs AND MERCURY

4. Proposed disposal/recycling/reclamation facility proposed for mercury-containing waste generated as part of this project, operating permit, and insurance certificate.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name and product technical description.
- B. Disposal drums shall be DOT 17-C or 17-H.
- C. Light tube and lamp boxes shall be provided by the reclamation facility. Only new boxes shall be used.

PART 3 - EXECUTION

3.1 BALLAST REMOVAL AND PACKAGING

- A. The Contractor shall remove all ballasts from light fixtures with care.
- B. The Contractor shall pack all ballasts in appropriately sized containers or drums with care, so as not to cause ballasts to leak as a direct result of removal and packing.
- C. The Contractor shall segregate all leaking ballasts from non-leaking ballasts, separately package leaking ballasts in plastic bags, and individually drum.
- D. The Contractor shall label all drums properly. The Contractor shall supply labels. Labels shall contain the following information:
 1. Drum contents
 2. DOT description
 3. Name, address, and telephone number of the Owner (i.e., the Generator)
 4. Emergency telephone numbers
 5. Date on which drum was filled with ballasts
 6. Class 9 label
- E. The Contractor shall ensure that no other material or waste is contained in the drums except the ballasts from fluorescent light fixtures.
- F. The Contractor shall not load drum with more than 750 pounds of gross weight.
- G. The Contractor shall not use any absorbent material to pack ballasts in drums.
- H. The Contractor shall not use any plastic liners in drums.

HANDLING OF LIGHTING BALLASTS AND LAMPS CONTAINING PCBs AND MERCURY

- I. Each drum shall be sealed and stored in a secure area to minimize inadvertent damage or vandalism.
- J. The ballasts will be removed by personnel wearing chemically resistant gloves, eye protection, and proper respiratory protection.

3.2 BALLAST DISPOSAL

- A. At the completion of the removal phase of the project, a transporter licensed to haul either PCB or non-PCB waste shall be contracted for disposal of the waste generated by the project work. Chain of custody records shall be maintained which include the date of pickup, number of drums, name of the transporter, and destination of waste for disposal. The Contractor shall be responsible for all disposal costs associated with the waste generated during this project.
- B. The Contractor shall provide a Certificate of Recycling and Disposal (CRD) pursuant to EPA Title 40 CFR, Part 761, Subpart K.
- C. The Contractor shall provide waste shipment records and disposal manifests for all PCB and non-PCB wastes generated and disposed from the project site. The Owner shall be provided sufficient time to identify agent for signatures on waste documentation. Contractor shall provide waste manifest to generation and destination state as required and provide Owner (Generator copy to agent signing manifests).

3.3 COLLECTION AND CONTAINMENT OF MERCURY LAMPS AND DEVICES

- A. All fluorescent lamps and devices to be removed are to be considered mercury-containing. Lamps are to be handled by personnel wearing gloves and eye protection for protection against glass breakage, and proper respiratory protection. Lamps are to be stored unbroken in DOT-approved waste containers that protect the lamps against breakage.

3.4 STORAGE AND DISPOSAL/RECYCLING OF MERCURY LAMPS AND DEVICES

- A. Each container shall be sealed and stored in a secure area to minimize inadvertent damage or vandalism. Each lamp or a container or package in which such lamps are contained must be labeled or marked clearly with one of the following phrases: "Universal Waste -- Lamp(s)," or "Waste Lamp(s)," or "Used Lamp(s)".
- B. At the completion of the mercury removal phase of the project, a transporter licensed to haul mercury-containing waste shall be contracted for disposal/recycling of the mercury waste. Chain-of-custody records shall be maintained which include the date of pickup, number of containers, name of mercury transporter, and destination of mercury waste disposal. The Contractor shall be responsible for all disposal/recycling costs associated with the mercury waste generated during this project.
- C. The Owner shall be provided a minimum of 72-hour notice of requirement for signature to identify agent for signatures on waste documentation. Contractor shall provide waste manifest

HANDLING OF LIGHTING BALLASTS AND LAMPS CONTAINING PCBs AND MERCURY

to generation and destination state as required and provide Owner (Generator copy to agent signing manifests) and Hazardous Materials Consultant.

END OF SECTION 028416

SECTION 030130 - MAINTENANCE OF 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:
 - 1. Removal of existing deteriorated concrete and subsequent replacement and patching.
- B. Related Requirements:

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, chemical composition, physical properties, test data, and mixing, preparation, and application instructions.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installers and manufacturers.
- B. Material Certificates: For each type of portland cement and aggregate supplied for mixing or adding to products at Project site.
- C. Product Test Reports: For each cementitious patching mortar, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Field quality-control reports.
- E. Maintenance Program: Submit before work begins.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Each cementitious patching-mortar manufacturer shall employ factory-trained technical representatives who are available for consultation and Project-site inspection and assistance at no additional cost.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer to apply packaged patching-mortar materials.
- C. Maintenance Program: Prepare a written plan for maintenance of cast-in-place concrete, including each phase or process, protection of surrounding materials during operations, and control of debris and runoff during the Work. Describe in detail materials, methods, equipment, and sequence of operations to be used for each phase of the Work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's written instructions for minimum and maximum temperature requirements and other conditions for storage.
- B. Store cementitious materials off the ground, under cover, and in a dry location.
- C. Store aggregates covered and in a dry location; maintain grading and other required characteristics and prevent contamination.

1.8 FIELD CONDITIONS

- A. Cold-Weather Requirements for Cementitious Materials: Comply with the following procedures:
 - 1. When air temperature is below 40 deg F, heat patching-material ingredients and existing concrete to produce temperatures between 40 and 90 deg F.
 - 2. When mean daily air temperature is between 25 and 40 deg F, cover completed Work with weather-resistant insulating blankets for 48 hours after repair or provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 48 hours after repair.
 - 3. When mean daily air temperature is below 25 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 48 hours after repair.
- B. Hot-Weather Requirements for Cementitious Materials: Protect repair work when temperature and humidity conditions produce excessive evaporation of water from patching materials. Provide artificial shade and wind breaks, and use cooled materials as required. Do not apply to substrates with temperatures of 90 deg F and above.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Source Limitations: Obtain each color, grade, finish, type, and variety of product from single source with resources to provide products of consistent quality in appearance and physical properties.
- B. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

2.2 PATCHING MORTAR

- A. Patching Mortar, General:
 - 1. Only use patching mortars that are recommended by manufacturer for each applicable horizontal, vertical, or overhead use orientation.
 - 2. Color and Aggregate Texture: Provide patching mortar and aggregates of colors and sizes necessary to produce patching mortar that matches existing, adjacent, exposed concrete. Blend several aggregates if necessary to achieve suitable matches.
- B. Polymer-Modified, Cementitious Patching Mortar: Packaged, dry mix for repair of concrete and that contains a latex additive as either a dry powder or a separate liquid that is added during mixing.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AQUAFIN, Inc.
 - b. BASF Construction Chemicals - Building Systems.
 - c. CGM, Incorporated.
 - d. Dayton Superior Corporation.
 - e. Euclid Chemical Company (The); an RPM company.
 - f. Kaufman Products, Inc.
 - g. Sika Corporation; Construction Product Division.
 - h. Sto Corp.; Concrete Restoration Division.
 - i. US SPEC; Division of US MIX Products Company.
 - j. W. R. Meadows, Inc.
 - 2. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.3 MIXES

- A. General: Mix products, in clean containers, according to manufacturer's written instructions.

1. Do not add water, thinners, or additives unless recommended by manufacturer.
 2. When practical, use manufacturer's premeasured packages to ensure that materials are mixed in proper proportions. When premeasured packages are not used, measure ingredients using graduated measuring containers; do not estimate quantities or use shovel or trowel as unit of measure.
 3. Do not mix more materials than can be used within time limits recommended by manufacturer. Discard materials that have begun to set.
- B. Mortar Scrub Coat: Mix dry ingredients with enough water to provide consistency of thick cream.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Notify Architect seven days in advance of dates when areas of deteriorated or delaminated concrete and deteriorated reinforcing bars will be located.
- B. Mark areas for removal of concrete by simplifying and squaring off boundaries and as directed by Architect. Make boundaries level and plumb unless otherwise indicated.
- C. Perform surveys as the Work progresses to detect hazards resulting from concrete-maintenance work.

3.2 PREPARATION

- A. Ensure that supervisory personnel are on-site and on duty when concrete maintenance work begins and during its progress.
- B. Preparation for Removal of Deteriorated Concrete: Examine construction to be repaired to determine best methods to safely and effectively perform concrete maintenance work. Examine adjacent work to determine what protective measures will be necessary. Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed in the course of repair.
 1. Provide and maintain shoring, bracing, and temporary structural supports as required to preserve stability and prevent unexpected or uncontrolled movement, settlement, or collapse of construction being demolished and construction and finishes to remain.
- C. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from concrete maintenance work.
 1. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.

2. Use only proven protection methods appropriate to each area and surface being protected.
 3. Provide barricades, barriers, and temporary directional signage to exclude public from areas where concrete maintenance work is being performed.
 4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of concrete maintenance work.
 5. Contain dust and debris generated by concrete maintenance work and prevent it from reaching the public or adjacent surfaces.
 6. Use water-mist sprinkling and other wet methods to control dust only with adequate, approved procedures and equipment that ensure that such water will not create a hazard or adversely affect other building areas or materials.
 7. Protect surfaces along haul routes from damage, wear, and staining.
 8. Protect adjacent surfaces and equipment by covering them with heavy polyethylene film and waterproof masking tape. If practical, remove items, store, and reinstall after potentially damaging operations are complete.
 9. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.
 10. Dispose of debris and runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.
- D. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is in working order.
1. Prevent solids such as aggregate or mortar residue from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from concrete maintenance work.
 2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.
- E. Concrete Removal:
1. Saw-cut perimeter of areas indicated for removal to a depth of at least 1/2 inch. Make cuts perpendicular to concrete surfaces and no deeper than cover on reinforcement.
 2. Remove deteriorated and delaminated concrete by breaking up and dislodging from reinforcement.
 3. Remove additional concrete to provide a depth of removal matching depth of existing concrete over entire removal area.
 4. Where half or more of the perimeter of reinforcing bar is exposed, bond between reinforcing bar and surrounding concrete is broken, or reinforcing bar is corroded, remove concrete from entire perimeter of bar and to provide at least a 3/4-inch clearance around bar.
 5. Test areas where concrete has been removed by tapping with hammer, and remove additional concrete until unsound and disbonded concrete is completely removed.
 6. Provide surfaces that are aligned with original concrete surfaces.
 7. Thoroughly clean removal areas of loose concrete, dust, and debris.

- F. Reinforcing-Bar Preparation: Remove loose and flaking rust from reinforcing bars by wire brushing until only tightly adhered light rust remains.

3.3 APPLICATION

- A. General: Comply with manufacturer's written instructions and recommendations for application of products, including surface preparation.
- B. Mortar Scrub Coat for Patching Mortar: Dampen repair area and surrounding concrete 6 inches beyond repair area. Remove standing water and apply scrub coat with a brush, scrubbing it into surface and thoroughly coating repair area. If scrub coat dries, recoat before placing patching mortar or concrete.
- C. Placing Patching Mortar: Place as follows unless otherwise recommended in writing by manufacturer:
 - 1. Provide forms where necessary to confine patch to required shape.
 - 2. Wet substrate and forms thoroughly and then remove standing water.
 - 3. Pretreatment: Apply specified mortar scrub coat.
 - 4. General Placement: Place patching mortar by troweling toward edges of patch to force intimate contact with edge surfaces. For large patches, fill edges first and then work toward center, always troweling toward edges of patch. At fully exposed reinforcing bars, force patching mortar to fill space behind bars by compacting with trowel from sides of bars.
 - 5. Consolidation: After each lift is placed, consolidate material and screed surface.
 - 6. Multiple Lifts: Where multiple lifts are used, score surface of lifts to provide a rough surface for placing subsequent lifts. Allow each lift to reach final set before placing subsequent lifts.
 - 7. Finishing: Allow surfaces of lifts that are to remain exposed to become firm and then finish to a surface matching adjacent concrete.
 - 8. Curing: Wet-cure cementitious patching materials, for not less than seven days by water-fog spray or water-saturated absorptive cover.

END OF SECTION 030130

SECTION 040120.63 - BRICK MASONRY REPAIR

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. Repairing brick masonry, including replacing units.

1.3 DEFINITIONS

- A. Rebuilding (Setting) Mortar: Mortar used to set and anchor masonry in a structure, distinct from pointing mortar installed after masonry is set in place.
- B. Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of masonry units to freezing and thawing.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to brick masonry repair including, but not limited to, the following:
 - a. Verify brick masonry repair specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, sequencing, tolerances, and required clearances.
 - c. Quality-control program.

1.5 SEQUENCING AND SCHEDULING

- A. Order sand for colored mortar immediately after approval of Samples. Take delivery of and store at Project site enough quantity to complete Project.

- B. Work Sequence: Perform brick masonry repair work in the following sequence, which includes work specified in this and other Sections:
1. Remove plant growth.
 2. Inspect masonry for open mortar joints and point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
 3. Remove paint.
 4. Clean masonry.
 5. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
 6. Repair masonry, including replacing existing masonry with new masonry materials.
 7. Rake out mortar from joints to be repointed.
 8. Point mortar and sealant joints.
 9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 2. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.
- B. Shop Drawings:
1. Include plans, elevations, sections, and locations of replacement masonry units on the structure, showing relation of existing and new or relocated units.
 2. Show provisions for expansion joints or other sealant joints.
 3. Show provisions for flashing and weep holes as required.
- C. Samples for Initial Selection: For the following:
1. Colored Mortar: Submit sets of mortar that will be left exposed in the form of sample mortar strips, 6 inches long by 1/2 inch wide, set in aluminum or plastic channels.
 - a. Have each set contain a close color range of at least three Samples of different mixes of colored sands and cements that produce a mortar matching existing, cleaned mortar when cured and dry.
 - b. Submit with precise measurements on ingredients, proportions, gradations, and source of colored sands from which each Sample was made.
 2. Sand Types Used for Mortar: Minimum 8 oz. of each in plastic screw-top jars.
 3. Include similar Samples of accessories involving color selection.

- D. Samples for Verification: For the following:
 - 1. Each type of brick unit to be used for replacing existing units. Include sets of Samples to show the full range of shape, color, and texture to be expected. For each brick type, provide straps or panels containing at least four bricks. Include multiple straps for brick with a wide range.
 - 2. Accessories: Each type of accessory and miscellaneous support.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For brick masonry repair specialist, including field supervisors and workers.
- B. Quality-control program.

1.8 QUALITY ASSURANCE

- A. Brick Masonry Repair Specialist Qualifications: Engage an experienced brick masonry repair firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience in only installing masonry is insufficient experience for masonry repair work.
 - 1. Field Supervision: Brick masonry repair specialist firm shall maintain experienced full-time supervisors on Project site during times that brick masonry repair work is in progress.
 - 2. Brick Masonry Repair Worker Qualifications: Engage experienced brick masonry repair workers to perform work of this Section.
- B. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising performance and preventing damage.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry units to Project site strapped together in suitable packs or pallets or in heavy-duty cartons and protected against impact and chipping.
- B. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

- D. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.
- E. Store sand where grading and other required characteristics can be maintained and contamination avoided.
- F. Handle masonry units to prevent overstressing, chipping, defacement, and other damage.

1.10 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit brick masonry repair work to be performed according to product manufacturers' written instructions and specified requirements.
- B. Temperature Limits, General: Repair masonry units only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.
- C. Cold-Weather Requirements: Comply with the following procedures for masonry repair unless otherwise indicated:
 - 1. When air temperature is below 40 deg F, heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 deg F.
 - 2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after repair.
- D. Hot-Weather Requirements: Protect masonry repairs when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.
- E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Source Limitations: Obtain each type of material for repairing brick masonry (brick, cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 MASONRY MATERIALS

- A. Face Brick: As required to complete brick masonry repair work.
 - 1. Brick Matching Existing: Units with colors, color variation within units, surface texture, size, shape and physical properties that match existing brickwork.
 - a. For existing brickwork that exhibits a range of colors or color variation within units, provide brick that proportionally matches that range and variation rather than brick that matches an individual color within that range.
 - 2. Grade SW.

2.3 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or Type II, except Type III may be used for cold-weather construction; white where required for color matching of mortar.
 - 1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Mortar Cement: ASTM C 1329/C 1329M.
- D. Mortar Sand: ASTM C 144.
 - 1. Exposed Mortar: Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
 - 2. Colored Mortar: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.
- E. Water: Potable.

2.4 ACCESSORY MATERIALS

- A. Setting Buttons and Shims: Resilient plastic, nonstaining to masonry, sized to suit joint thicknesses and bed depths of masonry units, less the required depth of pointing materials unless removed before pointing.
- B. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.
- C. Other Products: Select materials and methods of use based on the following:

1. Previous effectiveness in performing the work involved.
2. Minimal possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could leave residue on surfaces.

2.5 MORTAR MIXES

- A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.
- B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.
- C. Do not use admixtures in mortar unless otherwise indicated.
- D. Mixes: Mix mortar materials in the following proportions:
 1. Rebuilding (Setting) Mortar by Type: ASTM C 270, Proportion Specification, Type N unless otherwise indicated; with cementitious material limited to portland cement and lime.
 2. Colored Mortar: Add color to produce exposed, setting (rebuilding) mortar of colors required.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Prevent mortar from staining face of surrounding masonry and other surfaces.
 1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
 2. Keep wall area wet below rebuilding and repair work to discourage mortar from adhering.
 3. Immediately remove mortar splatters in contact with exposed masonry and other surfaces.

3.2 MASONRY REPAIR, GENERAL

- A. Appearance Standard: Repaired surfaces are to have a uniform appearance as viewed from 10 feet away by Architect.

3.3 BRICK REMOVAL AND REPLACEMENT

- A. At locations indicated, remove bricks that are damaged, spalled, or deteriorated. Carefully remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
 - 1. When removing single bricks, remove material from center of brick and work toward outside edges.
- B. Support and protect remaining masonry that surrounds removal area.
- C. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.
- D. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.
- E. Remove in an undamaged condition as many whole bricks as possible.
 - 1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
 - 2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
- F. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for brick replacement.
- G. Replace removed damaged brick with new brick matching existing brick.
- H. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
 - 1. Maintain joint width for replacement units to match existing joints.
 - 2. Use setting buttons or shims to set units accurately spaced with uniform joints.
- I. Lay replacement brick with rebuilding (setting) mortar and with completely filled bed, head, and collar joints. Butter ends with enough mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.
 - 1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
 - 2. When mortar is hard enough to support units, remove shims and other devices interfering with tooling of joints.
- J. Curing: Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.

1. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

3.4 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water applied by low-pressure spray.
 1. Do not use metal scrapers or brushes.
 2. Do not use acidic or alkaline cleaners.
- B. Clean adjacent nonmasonry surfaces of any debris from masonry work. Use detergent and soft brushes or cloths.
- C. Remove masking materials, leaving no residues that could trap dirt.

3.5 FIELD QUALITY CONTROL

- A. Architect's Project Representatives: Architect and/or Architect's Project Representatives shall help carry out Architect's responsibilities at the site, including observing progress and quality of portion of the Work completed.

3.6 MASONRY WASTE DISPOSAL

- A. Masonry Waste: Remove masonry waste and legally dispose of off Owner's property.

END OF SECTION 040120.63

SECTION 057300 - DECORATIVE METAL RAILINGS

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. Stainless-steel decorative railings.
- 2. Wrought iron and brass decorative railings to match existing.
- 3. Decorative thermoplastic / vinyl railing covers.

- B. Related Requirements:

- 1. Section 061000 "Rough Carpentry" for wood blocking for anchoring railings.

1.3 DEFINITIONS

- A. Railings: Guards and similar devices used for protection of occupants at open-sided floor areas.

1.4 COORDINATION AND SCHEDULING

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, anchor bolts, and items with integral anchors, that are to be embedded in masonry. Deliver items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not meet structural performance requirements.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Grout, anchoring cement, and paint products.
- B. Additional Submittals:
 - 1. Laboratory Test Reports for Paints and Coatings on Interior Decorative Metal Railings: Documentation indicating that products comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Shop Drawings: Include plans, elevations, sections, and attachment details.
- D. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.
- E. Samples for Verification: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including top rails, posts, and balusters.
 - 2. Fittings and brackets.
 - 3. Welded connections.
 - 4. Brazed connections.
 - 5. Assembled Samples of railing systems, made from full-size components, including top rail and infill. Show method of finishing members at intersections. Samples need not be full height.
- F. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Welding certificates.
- C. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.8 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of existing railings, walls, and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.
- B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 - 1. Copper Alloys: 60 percent of minimum yield strength.
 - 2. Stainless Steel: 60 percent of minimum yield strength.
 - 3. Steel: 72 percent of minimum yield strength.
- C. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Top Rails of Guards:
 - a. Uniform load of 50 lbf/ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
 - b. Infill load and other loads need not be assumed to act concurrently.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.
 - 1. Provide either formed- or cast-metal brackets with predrilled hole for exposed bolt anchorage, unless otherwise indicated.

2.3 COPPER ALLOYS

- A. Copper Alloys, General: Provide alloys indicated and with temper to suit application and forming methods, but with strength and stiffness not less than Temper H01 (quarter hard) for plate, sheet, strip, and bars.
- B. Extruded Shapes, Brass: ASTM B 249/B 249M, Alloy UNS C36000 (free-cutting brass).
- C. Castings, Brass: Sand castings complying with ASTM B 584, Alloy UNS C85200 (high-copper yellow brass).
- D. Plate, Sheet, Strip, and Bars; Brass: ASTM B 36/B 36M, Alloy UNS C26000 (cartridge brass, 70 percent copper).

2.4 STAINLESS STEEL

- A. Tubing: ASTM A 554, Grade MT 316L.
- B. Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 316L.
- C. Bars and Shapes: ASTM A 276, Type 316L.

2.5 STEEL AND IRON

- A. Bars: Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.
- B. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.6 WALL BRACKETS FOR STAINLESS-STEEL RAILINGS

- A. Wall Brackets:
 - 1. Basis-of Design Product: Subject to compliance with requirements, provide products by the following:
 - a. Julius Blum and Co., Inc., P.O. Box 816, Carlstadt, NJ 07072-0816.

- 1) Number 275 Wall Bracket.
 - a) Material: Type 304 Stainless Steel.
 - b) Finish: Satin finish: No. 4.
2. Substitutions: Requests for substitutions will be considered in accordance with provisions of Section 012500 "Substitution Procedures."

2.7 FASTENERS

- A. Fastener Materials: Unless otherwise indicated, provide the following:
 1. Copper-Alloy (Brass) Components: Silicon bronze (Alloy 651 or Alloy 655) fasteners where concealed; brass (Alloy 260 or Alloy 360) fasteners where exposed.
 2. Stainless-Steel Components: Type 304 stainless-steel fasteners.
 3. Uncoated Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating where concealed; Type 304 stainless-steel fasteners where exposed.
 4. Galvanized-Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
 5. Dissimilar Metals: Type 304 stainless-steel fasteners.
- B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless exposed fasteners are unavoidable.
 1. Provide flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.
 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 2. Material Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.8 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Brazing Rods: For copper-alloy railings, provide type and alloy as recommended by producer of metal to be brazed and as required for color match, strength, and compatibility in fabricated items.

- C. Low-Emitting Paints and Coatings: Paints and coatings applied to interior decorative metal railings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Lacquer for Copper Alloys: Clear acrylic lacquer specially developed for coating copper-alloy products.
- E. Shop Primers: Provide primers that comply with Section 099123 "Interior Painting."
- F. Intermediate Coats and Topcoats: Provide products that comply with Section 099123 "Interior Painting."

2.9 PLASTIC RAILING COVERS

- A. General: Provide decorative thermoplastic covering for standard metal handrails to match existing covers in profile, color and finished/installed appearance.
- B. Basis of design product: Alku-Rail Vinyl Handrail Covering, 127A Aviva Park Drive, Woodbridge Ontario, L4L 9C1, tel. 905-265-1093, website: www.alkuplastics.com; email: info@alkuplastics.com

2.10 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Cut, reinforce, drill, and tap as indicated to receive screws and similar items.
- F. Connections: Fabricate railings with welded connections unless otherwise indicated.
- G. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

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 flux immediately.
 4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds; no evidence of a welded joint.
- H. Brazed Connections: Connect copper-alloy railings by brazing. Cope components at connections to provide close fit, or use fittings designed for this purpose. Braze corners and seams continuously.
1. Use materials and methods that match color of base metal, minimize distortion, and develop maximum strength and corrosion resistance.
 2. Remove flux immediately.
 3. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and brazed surface matches contours of adjoining surfaces.
- I. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is fabricator's standard splicing method.
- J. Form changes in direction as follows:
1. As indicated.
- K. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L. Close exposed ends of railing members with prefabricated end fittings.
- M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch or less.
- N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and to prevent bracket or fitting rotation and crushing of substrate.
- O. Provide inserts and other anchorage devices for connecting railings to masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.11 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are not acceptable. Variations in appearance of other components are not acceptable.

2.12 COPPER-ALLOY FINISHES

- A. Finish designations for copper alloys comply with the system for designating copper-alloy finish systems defined in NAAMM's "Metal Finishes Manual for Architectural and Metal Products."
- B. Finish: Match existing finish.
 - 1. If lacquer is necessary to match existing finish, provide clear, organic coating: Lacquer specified for copper alloys, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil.

2.13 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
- C. Directional Satin Finish: No. 4.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.14 STEEL AND IRON FINISHES

- A. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, but galvanize anchors to be embedded in masonry.
- B. Preparing Nongalvanized Items for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- C. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1:

Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Shop prime uncoated railings with primer specified in Section 099123 "Interior Painting."
- D. Shop-Painted Finish: Comply with Section 099123 "Interior Painting."
1. Color: To match existing.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 2. Set pickets plumb within a tolerance of 1/16 inch in 3 feet.
 3. Align rails so variations from level for horizontal members do not exceed 1/4 inch in 12 feet.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 1. Coat concealed surfaces of copper alloys that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.3 ATTACHING RAILINGS

- A. Anchor railing ends to masonry as indicated.
- B. Attach stainless steel handrails to walls with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
 - 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
 - 2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure brass rails to walls at ends with end flanges to building construction as follows:
 - 1. For solid masonry anchorage, use drilled-in expansion shields and lag bolts.
 - 2. For hollow masonry anchorage, use toggle bolts.
- D. Secure stainless steel wall brackets to building construction per bracket manufacturer's written instructions.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and to prepare test reports. Payment for these services will be made by Owner.
- B. Extent and Testing Methodology: Testing agency will randomly select completed railing assemblies for testing that are representative of different railing designs and conditions in the completed Work. Test railings according to ASTM E 894 and ASTM E 935 for compliance with performance requirements.
- C. Remove and replace railings where test results indicate that they do not comply with specified requirements unless they can be repaired in a manner satisfactory to Architect and comply with specified requirements.
- D. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.

3.5 CLEANING

- A. Clean stainless steel by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.
- B. Clean copper alloys according to metal finisher's written instructions in a manner that leaves an undamaged and uniform finish matching approved Sample.
- C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "Interior Painting."
- D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

3.6 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 057300

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. Framing with dimension lumber.
 - 2. Wood blocking.
 - 3. Wood furring.
- B. Related Requirements:

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 size or greater but less than 5 inches nominal size in least dimension.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.

4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- B. Evaluation Reports: For the following, from ICC-ES:
 1. Fire-retardant-treated wood.
 2. Power-driven fasteners.
 3. Metal framing anchors.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products 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. Certified Wood: Wood materials shall be certified as "FSC Pure" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and to FSC STD-40-004, "FSC Standard for Chain of Custody Certification."
- B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 1. Factory mark each piece of lumber with grade stamp of grading agency.

2. Dress lumber, S4S, unless otherwise indicated.

C. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWWPA U1; Use Category UC2 for interior construction in contact with concrete.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood blocking and similar concealed members in contact with masonry or concrete.

2.3 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. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

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.

C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

- E. Application: Treat items indicated on Drawings, and the following:
 - 1. Concealed blocking.
 - 2. Framing for non-load-bearing partitions.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Furring.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:
 - 1. Hem-fir (north); NLGA.
 - 2. Mixed southern pine or southern pine; SPIB.
 - 3. Spruce-pine-fir; NLGA.
 - 4. Hem-fir; WCLIB or WWPA.
 - 5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
- C. Concealed Boards: 15 percent maximum moisture content and any of the following species and grades:
 - 1. Mixed southern pine or southern pine; No. 2 grade; SPIB.
 - 2. Hem-fir or hem-fir (north); Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
 - 3. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
- D. For blocking used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.5 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 pressure-preservative treated, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: 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 AC193 as appropriate for the substrate.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.6 METAL FRAMING ANCHORS

- A. Anchors provided for Work in this Section shall meet or exceed requirements of loading for attaching or fastening. Manufacturer's published allowable design load values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
- B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
- C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
 1. Use for wood-preserved-treated lumber and where indicated.

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. Locate furring, blocking, and similar supports to comply with requirements for attaching other construction.
- C. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- E. Provide fire blocking in furred spaces and other concealed cavities as indicated and as follows:
 1. Fire block furred spaces of walls at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
- F. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with

function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

- G. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use copper naphthenate for items not continuously protected from liquid water.
- H. 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.
- I. Use hot-dip galvanized steel fasteners 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. Countersink fasteners where necessary to coordinate with materials and finishes.

3.2 WOOD BLOCKING INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal-size furring as indicated on Drawings.

END OF SECTION 061000

SECTION 062023 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Interior trim.
2. Interior plywood paneling.

- B. Related Requirements:

1. Section 061000 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
2. Section 099123 "Interior Painting" for priming and backpriming of interior finish carpentry.
3. Section 099300 "Staining and Transparent Finishing."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

- B. Additional Submittals:

1. Certificates for Chain-of-Custody: Certificates indicating that wood products comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body.
2. Product Data for Adhesives and Glues Used at Project Site: Documentation including printed statement of VOC content.
3. Laboratory Test Reports for Adhesives: Documentation indicating that products comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

- C. Samples for Verification:

1. For each species and cut of lumber and panel products, 50 sq. in. for lumber and 8 by 10 inches for panels.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.
- B. Deliver interior finish carpentry materials only when environmental conditions meet requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and the following grading rules:
 1. NeLMA: Northeastern Lumber Manufacturers' Association, "Standard Grading Rules for Northeastern Lumber."
 2. NHLA: National Hardwood Lumber Association, "Rules for the Measurement and Inspection of Hardwood & Cypress."
 3. NLGA: National Lumber Grades Authority, "Standard Grading Rules for Canadian Lumber."

4. SPIB: The Southern Pine Inspection Bureau, "Standard Grading Rules for Southern Pine Lumber."
 5. WCLIB: West Coast Lumber Inspection Bureau, Standard No. 17, "Grading Rules for West Coast Lumber."
 6. WWPA: Western Wood Products Association, "Western Lumber Grading Rules."
- B. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
1. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.

2.2 INTERIOR TRIM

A. Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish):

1. Species and Grade: Hard Maple, Select Grade or Better.
2. Maximum Moisture Content: 10 percent.
3. Finger Jointing: Not allowed.
4. Gluing for Width: Not allowed.
5. Veneered Material: Not allowed.
6. Face Surface: Surfaced (smooth).
7. Matching: Selected for compatible grain and color.

2.3 PANELING

A. Hardwood Veneer Plywood Paneling: Manufacturer's stock hardwood plywood panels complying with HPVA HP-1.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated:
 - a. Baltic Birch plywood (noted as BB PWD on Drawings)
2. Grade: B/BB.
3. Veneer Matching: Selected for similar color and grain.
4. Backing Veneer Species: Same species as face veneer.
5. Construction: Veneer core.
6. Thickness: 3/4 inch unless specifically noted otherwise on the drawings.
7. Panel Size: 60 by 60 inches.
8. Adhesive: Exterior grade adhesive.
9. Finishes:
 - a. Transparent Stain and Finish: Match Architect's samples.
 - b. Opaque Finish: Manufacturer's standard paint-ready finish, ready to receive painted finishes as indicated in Section 099123 "Interior Painting," matching Architect's samples.

2.4 MISCELLANEOUS MATERIALS

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
- B. Low-Emitting Materials: Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.
 - 1. Adhesive shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 FABRICATION

- A. Back out or kerf backs of the following members except those with ends exposed in finished work:
 - 1. Interior standing and running trim except shoe and crown molds.
 - 2. Wood-board paneling.
- B. Ease edges of lumber to 1/16-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

- B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, too small to fabricate with proper jointing arrangements, or with defective surfaces, sizes, or patterns.
- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
 - 3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
 - 4. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
 - 1. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
 - 2. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 PANELING INSTALLATION

- A. Plywood Paneling: Select and arrange panels on each wall to minimize noticeable variations in grain character and color between adjacent panels.

1. Attach panels to supports with manufacturer's recommended panel adhesive and fasteners. Space fasteners and adhesive as recommended by panel manufacturer.
2. Conceal fasteners to greatest practical extent.

3.6 ADJUSTING

- A. Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.7 CLEANING

- A. Clean interior finish carpentry on exposed and semiexposed surfaces. Restore damaged or soiled areas and touch up finishes.

3.8 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062023

SECTION 064116 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

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. Plastic-laminate-faced architectural cabinets.
- 2. Plastic-laminate-faced countertops.
- 3. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

- B. Related Requirements:

- 1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product, including panel products, laminates, thermoset decorative panels, adhesives, cabinet hardware, and accessories.

- B. Additional Submittals:

- 1. Chain-of-Custody Certificates: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification and chain-of-custody requirements.

2. Laboratory Test Reports for Adhesives: Documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 3. Product Data for Adhesives and Composite Wood Products: For adhesives and composite wood products, documentation indicating that products contain no urea formaldehyde.
 4. Laboratory Test Reports for Composite Wood Products: For composite wood products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
1. Show details.
 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 3. Show locations and sizes of cutouts and holes for items installed in architectural plastic-laminate cabinets and plastic-laminate countertops.
 4. Apply AWI Quality Certification Program label to Shop Drawings.
- D. Samples for Initial Selection:
1. Plastic laminates.
 2. PVC edge material.
 3. Thermoset decorative panels.
- E. Samples for Verification:
1. Plastic laminates, 12 by 12 inches, for each type, color, pattern, and surface finish.
 2. Thermoset decorative panels, 12 by 12 inches, for each color, pattern, and surface finish, with edge banding on one edge.
 3. Corner pieces as follows:
 - a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
 4. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and fabricator.

- B. Product Certificates: For each type of product, including, but not limited to, laminates and adhesives.
- C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

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. Shop is a certified participant in AWI's Quality Certification Program.
- B. Installer Qualifications: Fabricator of products and certified participant in AWI's Quality Certification Program.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets and countertops until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets and countertops must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets or countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where cabinets and countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support cabinets and countertops by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where cabinets and countertops are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.9 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets and countertops can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. Provide labels and certificates from AWI certification program indicating that woodwork, including installation, complies with requirements of grades specified.
- B. Grade: Custom.
- C. Certified Wood: Plastic-laminate cabinets shall be made from wood products certified as "FSC Pure" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and FSC STD-40-004, "FSC Standard for Chain of Custody Certification."
- D. Type of Construction: Face frame.
- E. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
- F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
 - 1. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
 - a. Abet Laminati, Inc.
 - b. Formica Corporation.
 - c. Lamin-Art, Inc.
 - d. Nevamar Company, LLC; Decorative Products Div.
 - e. Wilsonart International; Div. of Premark International, Inc.
- G. Laminate Cladding for Exposed Surfaces, including face frame fronts and edges:
 - 1. Postformed Surfaces: Grade HGP.
 - 2. Vertical Surfaces: Grade HGS.
 - 3. Edges: Grade HGS.
 - 4. Pattern Direction: As directed by Architect.
- H. Materials for Semiexposed Surfaces:

1. Cabinet Interior Surfaces: Thermoset decorative panels.
 - a. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.
 2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
 3. Drawer Bottoms: Thermoset decorative panels.
- I. Concealed Backs of Cabinet Panels with Exposed Plastic-Laminate or Thermoset Decorative Panel Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- J. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners.
- K. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. As selected by Architect from laminate manufacturer's full range in the following categories:
 - a. Solid colors, finish as selected by Architect.
 - b. Patterns, finish as selected by Architect.

2.2 PLASTIC-LAMINATE COUNTERTOPS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.
1. Provide labels and certificates from AWI certification program indicating that countertops, including installation, comply with requirements of grades specified.
- B. Grade: Custom.
- C. Certified Wood: Plastic-laminate countertops shall be made from wood products certified as "FSC Pure" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and FSC STD-40-004, "FSC Standard for Chain of Custody Certification."
- D. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGP.
1. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
 - a. Abet Laminati, Inc.
 - b. Formica Corporation.
 - c. Lamin-Art, Inc.

- d. Nevamar Company, LLC; Decorative Products Div.
 - e. Wilsonart International; Div. of Premark International, Inc.
- E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
- 1. As selected by Architect from laminate manufacturer's full range in the following categories:
 - a. Solid colors, finish as selected by Architect.
 - b. Patterns, finish as selected by Architect.
- F. Edge Treatment: Post-formed continuously with countertop laminate cladding.
- G. Backsplashes: Post-formed continuously with countertop laminate cladding.
- H. Core Material: Exterior-grade plywood.
- I. Core Material at Sinks: Exterior-grade plywood.
- J. Core Thickness: 3/4 inch.
- 1. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.
 - 2. Build up countertop thickness with additional core material as necessary for indicated configuration of front edge of countertop.
 - 3. Provide 3/4 inch core material at backsplashes.
- K. Paper Backing: Provide paper backing on underside of countertop substrate.

2.3 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
- 1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
- 1. Composite Wood and Agrifiber Products: Products shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
3. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
4. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
5. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.4 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087111 "Door Hardware (Descriptive Specification)."
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 100 degrees of opening.
- C. Back-Mounted Pulls: BHMA A156.9, B02011.
- D. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.
- E. Catches: Magnetic catches, BHMA A156.9, B03141.
- F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- G. Shelf Rests: BHMA A156.9, B04013; metal.
- H. Drawer Slides: BHMA A156.9.
 1. Grade 1HD-100: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
 2. For trash bins provide Grade 1HD-100.
- I. Door and Drawer Silencers: BHMA A156.16, L03011.
- J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
- K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.5 MISCELLANEOUS MATERIALS

- A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use

nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

- B. Adhesives: Do not use adhesives that contain urea formaldehyde.
- C. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive.

2.6 FABRICATION

- A. Fabricate cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor cabinets to anchors or blocking concealed or directly attached to substrates. Secure with countersunk, concealed fasteners. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork.
 - 1. Use filler matching finish of items being installed.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION 064116

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. Penetrations in fire-resistance-rated walls.
 - 2. Penetrations in horizontal assemblies.
- B. Related Requirements:

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Additional Submittals:
 - 1. Product Data for Firestopping Sealants and Sealant Primers: Provide documentation including printed statement of VOC content.
 - 2. Laboratory Test Reports for Firestopping Sealants and Sealant Primers: Provide documentation indicating that products comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

- B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products.
 - b. Hilti, Inc.
 - c. Tremco, Inc.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
- D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.
- E. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content:
 - 1. Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- F. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- G. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and

inspecting agency for conditions indicated. Accessories include, but not limited to, the following:

1. Permanent forming/damming/backing materials.
2. Substrate primers.
3. Collars.
4. Steel sleeves.

2.3 FILL MATERIALS

- A. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- B. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- C. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.
- D. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
- E. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- F. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- G. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- H. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- I. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.4 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce

products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately 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 materials.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

- C. Install fill materials by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are 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 material and install new materials to produce systems complying with specified requirements.

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. Mildew-resistant joint sealants.
 - 3. Urethane joint sealants.
- B. Related Requirements:
 - 1. Section 079219 "Acoustical Joint Sealants" for sealing joints in sound-rated construction.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Additional Submittals:
 - 1. Product Data for Sealants and Sealant Primers: Documentation including printed statement of VOC content.
 - 2. Laboratory Test Reports for Sealants and Sealant Primers: Documentation indicating that products comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

- D. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- E. 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.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.
- C. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.7 FIELD 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.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than or greater 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.

1.8 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 2. Disintegration of joint substrates from 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 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Low-Emitting Interior Sealants: Sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation.
 - b. GE Advanced Materials – Silicones.
 - c. Pecora Corporation.

- d. Sika Corporation, Construction Products Division.
- e. Tremco Incorporated.

2.3 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Neutral-Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - 1. Basis-of-Design Products: Subject to compliance with requirements, provide products from the following:
 - a. Pecora Corporation.
 - 2. Substitutions: Requests for substitutions will be considered in accordance with provisions of Section 012500 "Substitution Procedures."

2.4 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, T: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use T.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Building Systems.
 - b. Sika Corporation, Construction Products Division.
 - c. Tremco Incorporated.

2.5 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, 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 performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. 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.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
- 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
- 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
 1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Vertical joints on exposed surfaces of unit masonry.
 - c. Other joints as indicated on Drawings.
 2. Joint Sealant: Silicone, S, NS, 100/50, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
 1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Other joints as indicated on Drawings.
 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
 - 1. Joint Sealant: Urethane, S, NS, 25, T.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 079219 - ACOUSTICAL 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 acoustical joint sealants.
- B. Related Requirements:
 - 1. Section 079200 "Joint Sealants" for elastomeric, latex, and butyl-rubber-based joint sealants for nonacoustical applications.

1.3 ACTION SUBMITTALS

- A. Product Data: For each acoustical joint sealant.
- B. Additional Submittals:
 - 1. Product Data for Sealants and Sealant Primers: Documentation including printed statement of VOC content.
 - 2. Laboratory Test Reports for Sealants and Sealant Primers: Documentation indicating that products comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- D. Samples for Verification: For each kind and color of acoustical joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each kind of acoustical joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.

- B. Sample Warranties: For special warranties.

1.5 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace acoustical joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish acoustical joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E 90.
- B. Low-Emitting Interior Sealants: Acoustical sealants and sealant primers shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C 834.
 - 1. Basis-of Design Product: Subject to compliance with requirements, provide products from the following:
 - a. Tremco, Inc.
 - 1) Tremflex 834.
 - 2. Substitutions: Requests for substitutions will be considered in accordance with provisions of Section 012500 "Substitution Procedures."

2.3 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by acoustical-joint-sealant manufacturer where required for adhesion of sealant to joint substrates.
- 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: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive acoustical joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where recommended by acoustical-joint-sealant manufacturer. 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 ACOUSTICAL JOINT SEALANTS

- A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.
- B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C 919, ASTM C 1193, and manufacturer's written recommendations for closing off

sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.

- C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

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 acoustical joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect acoustical joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079219

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes hollow-metal work.
- B. Section includes door silencers.
- C. Related Requirements:
 - 1. Section 081416 "Flush Wood Doors."
 - 2. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.
 - 3. Section 088813 "Fire-Resistant Glazing" for glazing in fire-rated hollow-metal doors.

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, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
1. Elevations of each door type.
 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 4. Locations of reinforcement and preparations for hardware.
 5. Details of each different wall opening condition.
 6. Details of anchorages, joints, field splices, and connections.
 7. Details of accessories.
 8. Details of moldings, removable stops, and glazing.
- C. Samples for Initial Selection: For units with factory-applied primed finishes.
- D. Samples for Verification:
1. For each type of factory-applied primed finish, prepared on Samples of not less than 3 by 5 inches.
 2. For "Doors" and "Frames" subparagraphs below, prepare Samples approximately 12 by 12 inches to demonstrate compliance with requirements for quality of materials and construction:
 - a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
 - b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.
- E. Schedule: Provide a schedule of hollow-metal work 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 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.8 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 nonvented plastic.

1. Provide additional protection to prevent damage to factory-primed units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Ceco Door Products; an Assa Abloy Group company.
 2. Curries Company; an Assa Abloy Group company.
 3. Kewanee Corporation (The).
 4. Mesker Door Inc.
 5. Steelcraft; an Ingersoll-Rand company.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

2.3 INTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3.
 1. Physical Performance: Level A according to SDI A250.4.
 2. Doors:
 - a. Type: As indicated in the Door Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 16 ga.
 - d. Edge Construction: Model 2, Seamless.
 - e. Core: Manufacturer's standard.
 3. Frames:

- a. Materials: Uncoated, steel sheet, minimum thickness of 0.053 inch.
 - b. Construction: Knock-down.
4. Finish: Factory-primed.
5. Final Finish: Field-painted.

2.4 EXTERIOR HOLLOW-METAL DOORS

- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors: SDI A250.8, Level 3.
- 1. Physical Performance: Level A according to SDI A250.4.
 - 2. Doors:
 - a. Type: As indicated in the Door Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Metallic-coated steel sheet, minimum thickness of 16 ga, with minimum A40 coating.
 - d. Edge Construction: Model 2, Seamless.
 - e. Core: Manufacturer's standard insulated doors.
 - 1) Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than required R-value when tested according to ASTM C 1363.
 - 3. Finish: Factory-primed.
 - 4. Final Finish: Field-painted.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
- 1. Stud-Wall Type: Designed to engage stud; not less than 0.042 inch thick.
- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
- 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.6 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. 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.
- G. Glazing: Comply with requirements in Section 088813 "Fire-Resistant Glazing."

2.7 FABRICATION

- A. Fabricate hollow-metal work 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 Doors:
 - 1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
 - 2. Fire Door Cores: As required to provide fire-protection ratings indicated.
 - 3. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
 - 4. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
 - 5. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.
 - a. Bottom Edge Closures at Doors with Weather Stripping Gasketing: Close bottom edges of doors where required for attachment of weather stripping with flat end closures of same material as face sheets.
 - 6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Provide countersunk, flat-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 2. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor.
 3. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - b. Postinstalled Expansion Type: Install floor anchors for each jamb with postinstalled expansion-type anchors, unless otherwise noted.
 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 door silencers.
 - b. Provide door silencers.
- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- F. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints. Coordinate Work with fire-resistant glazing manufacturer's written requirements.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
 2. Provide fixed frame moldings on secure side of interior doors and frames.
 3. Provide loose stops and moldings on inside of hollow-metal work.

4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.8 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 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 doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - b. Install frames with removable stops located on secure side of opening.
 - c. Install door silencers in frames.
 - d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - e. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 4. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
 - c. At Bottom of Door: 3/4 inch plus or minus 1/32 inch.
 - d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Glazing: Comply with installation requirements in Section 088813 "Fire-Resistant Glazing" and with hollow-metal manufacturer's written instructions.

1. Secure stops with countersunk flat-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner, unless otherwise indicated by fire-resistant glazing manufacturer.

3.4 FINISHES FOR METALLIC-COATED DOORS

- A. Metallic-Coated Doors:
 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. Preparing Metallic-Coated Doors for Shop Priming: After galvanizing, thoroughly clean doors of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
- C. Primer Application: Apply shop primer to prepared surfaces of doors unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting.
 1. Shop-prime uncoated doors with zinc-rich primer.
- D. Intermediate Coat: Apply latex intermediate coat, at spreading rate and thickness as recommended by coating manufacturer.
 1. Color: Match topcoat.
- E. Topcoat: Apply latex topcoat, at spreading rate and thickness as recommended by coating manufacturer.
 1. Color: As selected by Architect from manufacturer's full range.

3.5 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Metallic-Coated Surface Touchup: Immediately after erection, clean abraded areas and sand smooth rusted or damaged areas. Repair with galvanizing repair paint according to manufacturer's written instructions and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION 081113

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 priming and finishing flush wood doors.
 - 3. Machining doors for hardware.
- B. Related Requirements:
 - 1. Section 087100 "Door Hardware" for door hardware for flush wood doors.
 - 2. Section 088000 "Glazing" for glass view panels in flush wood doors.
 - 3. Section 099300 "Staining and Transparent Finishing."

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 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. Additional Submittals:
 - 1. Certificates for Chain-of-Custody: Certificates indicating that flush wood doors comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body.
 - 2. Product Data for Adhesives: Documentation indicating that product contains no urea formaldehyde.
 - 3. Laboratory Test Reports for Adhesives: Documentation indicating that products comply with the testing and product requirements of the California Department of Health

Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

4. Laboratory Test Reports for Stains and Finishes: Documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- C. 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.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.
7. Fire-protection ratings for fire-rated doors.

- D. Samples for Initial Selection: For factory-finished doors.

- E. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials and finishes 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.
3. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.
- B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body, and is a certified participant in AWI's Quality Certification Program.

- B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1.9 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. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. 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, provide products by one of the following:
 - 1. Eggers Industries.
 - 2. Marshfield Door Systems, Inc.
 - 3. Oshkosh Architectural Door Company.

4. VT Industries Inc.

B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Standards."

1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.

B. Certified Wood: Flush wood doors shall be certified as "FSC Pure" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and to FSC STD-40-004, "FSC Standard for Chain of Custody Certification."

C. Low-Emitting Materials: Fabricate doors with adhesives and products that do not contain urea formaldehyde.

D. Low-Emitting Materials: Fabricate doors with adhesives and products that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

F. Glued-Wood-Stave-Core Doors: Made with any combination of blocks or strips, not more than 2-1/2 inches (64 mm) wide, of one species of wood glued together (in butcher block fashion) with joints staggered in adjacent rows.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Custom (Grade B faces).

2. Species: Match existing.

3. Cut: Match existing.

4. Match between Veneer Leaves: Match existing.

5. Assembly of Veneer Leaves on Door Faces: Match existing.

6. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.

7. Exposed Vertical Edges: Same species as faces - edge Type A.

8. Core: Glued wood stave.

9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.

10. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

2.4 LIGHT FRAMES

- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
 - 1. Wood Species: Same species as door faces.
 - 2. Profile: Match existing beads.

2.5 FABRICATION

- A. Where new door frames are indicated, factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
 - 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- C. Openings: Factory cut and trim openings through doors.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."

2.6 SHOP PRIMING

- A. Doors for Transparent Finish: Shop prime faces and all four edges with stain (if required), other required pretreatments, and first coat of finish as specified in Section 099300 "Staining and Transparent Finishing." Seal edges of cutouts and mortises with first coat of finish.

2.7 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Use only paints and coatings that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Transparent Finish:

1. Grade: Custom.
2. Finish: AWI's "Architectural Woodwork Standards" System 11, catalyzed polyurethane.
3. Staining: Match existing.
4. Effect: Match existing.
5. Sheen: Match existing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware.
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 2. Bevel doors 1/8 inch in 2 inches at lock and hinge edges.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or 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 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Access doors and frames for walls and ceilings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, materials, individual components and profiles, and finishes.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Detail fabrication and installation of access doors and frames for each type of substrate.
- C. Samples: Full-size sample for each door, in factory-primed finish.
- D. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Acudor Products, Inc.
 - 2. Babcock-Davis.
 - 3. Larsen's Manufacturing Company.

- B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.
- C. Flush Access Doors with Exposed Flanges:
 - 1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
 - 2. Locations: Wall and ceiling.
 - 3. Door Size: As required.
 - 4. Uncoated Steel Sheet for Door: Manufacturer's standard thickness.
 - a. Finish: Factory prime.
 - 5. Frame Material: Same material, thickness, and finish as door.
 - 6. Hinges: Manufacturer's standard.
 - 7. Hardware: Latch.
- D. Hardware:
 - 1. Latch: Cam latch operated by screwdriver.

2.2 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- C. Frame Anchors: Same type as door face.
- D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.3 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
 - 1. Provide mounting holes in frames for attachment of units to metal or wood framing.

2. Provide mounting holes in frame for attachment of masonry anchors.
- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

2.4 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical 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 not acceptable.
- D. Steel Finishes:
 1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Install doors flush with adjacent finish surfaces.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

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 081113 "Hollow Metal Doors and Frames" for door silencers provided as part of hollow-metal frames.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples for Verification: For exposed door hardware of each type required, in each finish specified, prepared on Samples of size indicated below. Tag Samples with full description for coordination with the door hardware schedule. Submit Samples before, or concurrent with, submission of door hardware schedule.
 - 1. Sample Size: Full-size units or minimum 2-by-4-inch Samples for sheet and 4-inch long Samples for other products.
 - a. Full-size Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.
- C. Other Action Submittals:
 - 1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and

diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

- a. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
 - b. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
 - c. Content: Include the following information:
 - 1) Identification number, location, hand, fire rating, size, and material of each door and frame.
 - 2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - 3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - 4) Fastenings and other pertinent information.
 - 5) Explanation of abbreviations, symbols, and codes contained in schedule.
 - 6) Mounting locations for door hardware.
2. 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and Architectural Hardware Consultant.
- B. Product Certificates:
 1. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
- C. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
- D. Warranty: Special warranty specified in this Section.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant 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.
- B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as follows:
 - 1. For door hardware, an Architectural Hardware Consultant (AHC).
- C. Source Limitations: Obtain each type of door hardware from a single manufacturer.
- D. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.
- E. 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.
- F. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and 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.
 - b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - 3. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.
- G. Keying Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." In addition to Owner, Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant and Owner's security consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Preliminary key system schematic diagram.
3. Requirements for key control system.
4. Requirements for access control.
5. Address for delivery of keys.

H. 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.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to Owner in person.

1.8 COORDINATION

- A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- C. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
2. Warranty Periods:
 - a. Ten years from date of Substantial Completion for mortise locks and latches.
 - b. Five years from date of Substantial Completion for exit devices.

1.10 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 twelve 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.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled on Drawings to comply with requirements in this Section.
 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.
- B. Designations: 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.

2.2 HINGES

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Baldwin Hardware Corporation.
 - b. Bommer Industries, Inc.
 - c. Hager Companies.
 - d. Stanley Commercial Hardware; Div. of The Stanley Works.
 - e. Harney Hardware
 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
 4. Hinge Options: Comply with the following where indicated in the Hardware Sets or on Drawings:
 - a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:
 - 1) Out-swinging exterior doors.

2.3 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
1. Mortise Locks: Minimum 3/4-inch latchbolt throw.
- C. Lock Backset: 2-3/4 inches, unless otherwise indicated.
- D. Lock Trim:

1. Levers: Cast.
 - a. Provide tactile warning on lever at Door 104A.
 2. Escutcheons (Roses): Cast.
 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.
- F. Mortise Locks: BHMA A156.13; Operational Grade 1; stamped steel case with steel or brass parts; Series 1000.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Adams Rite Manufacturing Co.
 - b. Corbin Russwin Architectural Hardware.
 - c. Sargent Manufacturing Company.
 - d. Yale Security Inc.
 - e. Harney Hardware

2.4 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: BHMA A156.3.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Mounting rails to be formed from smooth stainless steel architectural material no less than 0.072" thick, with push rails a minimum of 0.062" thickness. Painted or aluminum metal rails are not acceptable. Exit device latch to be investment cast stainless steel, pullman type, with deadlock feature.
1. Provide the following:
 - a. Rim exit devices at single doors.
 - b. Concealed vertical rod exit devices at new pair of hollow metal doors.
 - c. Lever handle operation at pull side of doors, with integral lock at exterior door.
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Corbin Russwin Hardware.
 - b. Sargent Manufacturing.
 - c. Yale Locks and Hardware.
 - d. Harney Hardware

2.5 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. High-Security Lock Cylinders: BHMA A156.30; Grade 1; Type M, mechanical; permanent cores that are removable; face finished to match lockset.
- D. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.6 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
 1. Existing System:
 - a. Master key or grand master key locks to Owner's existing system.
- B. Keys: Nickel silver.
 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: Information to be furnished by Owner.
 2. Quantity: In addition to one extra key blank for each lock, provide the following:
 - a. Cylinder Change Keys: Three.
 - b. Master Keys: Five.
 - c. Grand Master Keys: Five.

2.7 KEY VAULT

- A. Key Lock Boxes: Designed for storage of two keys and accessed by fire / emergency personnel.
 1. Provide key lock box for exterior mounting.
 - a. Basis of Design: Knox Box 3200 series
 - 1) Surface-mounted
 - 2) Color as selected by Architect from mfr's standard range

2.8 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length, as tested according to ASTM E 283, for exterior door weather stripping at jambs and head of door frames, and exterior door weather stripping door bottoms, compatible with existing thresholds; with resilient or flexible seal strips that are easily replaceable and readily available

from stocks maintained by manufacturer, as selected by Architect from Manufacturer's full range.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. National Guard Products.
 - c. Pemko Manufacturing Co.; an ASSA ABLOY Group company.
 - d. Reese Enterprises, Inc.
 - e. Zero International.

2.9 METAL PROTECTIVE TRIM UNITS

A. Door Protective trim

1. General: Door protective trim units to be of type and design as specified below.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Metal Protection Plates: ANSI/BHMA A156.6 certified metal protection plates (kick, armor, or mop), beveled on four edges (B4E), fabricated from the following:
 - a. Stainless Steel: 300 series, 050-inch thick, with countersunk screw holes (CSK).
4. Fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets.
5. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Burns Manufacturing.
 - b. Hiawatha, Inc.
 - c. Rockwood Manufacturing.
 - d. Trimco.

2.10 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and

hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.

- C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 - 2. Fire-Rated Applications:
 - a. Wood or Machine Screws: For the following:
 - 1) Hinges mortised to doors or frames.
 - 2) Strike plates to frames.
 - b. Steel Through Bolts: For the following unless door blocking is provided:
 - 1) Surface hinges to doors.
 - 2) Surface-mounted exit devices.
 - 3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
 - 4. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.11 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated on Drawings and to comply with the following, unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Wood Doors: DHI WDHS.3, "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. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

- D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Replace construction cores with permanent cores as directed by Owner.
- E. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- F. Perimeter Weather Stripping Gasketing: Apply to heads, jambs, and door bottoms, forming seal between door and frame, and between door and threshold.

3.4 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
 - 1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. 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.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Section 017900 "Demonstration and Training."

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Glass for interior doors.
 - 2. Glazing sealants and accessories.
- B. Related Requirements:
 - 1. Section 088813 "Fire-Resistant Glazing."

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. IBC: International Building Code.

1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Additional Submittals:
 - 1. Laboratory Test Reports for Glazing Sealants: Documentation indicating that products comply with the testing and product requirements of the California Department of

Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

- C. Glass Samples: For each type of the following products; 12 inches square.
 - 1. Fully tempered glass.
- D. Glazing Accessory Samples: For sealants, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For glass.
- B. Product Test Reports: For tempered glass and glazing sealants, for tests performed by a qualified testing agency.
 - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- C. Preconstruction adhesion and compatibility test report.
 - 1. Provide data based on previous testing of current sealant products and glazing materials matching those submitted.
- D. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

- A. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- B. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.8 WARRANTY

- A. Manufacturer's Special Warranty for Fully Tempered Glass: Manufacturer agrees to replace tempered-glass units that deteriorate within specified warranty period. Deterioration of tempered glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning tempered glass contrary to manufacturer's written instructions. Defects include blemishes exceeding those allowed by referenced tempered-glass standard.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Glass: Obtain from single source from single manufacturer.
- B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and impact loads without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- C. Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 - 1. For monolithic-glass lites, properties are based on units with lites 6 mm thick, unless otherwise indicated.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: "Glazing Manual."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Thickness: Where glass thickness is indicated, it is a minimum.
- D. Strength: Provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated), Type I, Class 1 (clear), Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.5 GLAZING SEALANTS

- A. General:
 - 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. Sealants shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Door manufacturer's standard glazing sealant.

2.6 GLAZING TAPES

- A. Glazing Tape: Door manufacturer's standard glazing tape.

2.7 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.8 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
 - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Minimum required face and edge clearances.
 - 3. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, other glazing materials, and doors, unless more stringent requirements are indicated, including those in referenced glazing publications.

- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- G. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.4 TAPE GLAZING

- A. Provide tape glazing according to door manufacturer's written instructions.

3.5 SEALANT GLAZING (WET)

- A. Provide sealant glazing according to door manufacturer's written instructions.

3.6 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces at frequent intervals during construction, but not less than once a week, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.

- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.7 MONOLITHIC GLASS SCHEDULE

- A. Glass Type for Interior Doors: Clear fully-tempered float glass.
 - 1. Minimum Thickness: 6 mm, unless otherwise indicated.
 - 2. Safety glazing required.

END OF SECTION 088000

SECTION 088813 - FIRE-RESISTANT GLAZING

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. Fire-protection-rated glazing.

- B. Related Requirements:

- 1. Section 081113 "Hollow Metal Doors and Frames.
- 2. Section 081416 "Flush Wood Doors."

1.3 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings
- B. Consumer Product Safety Commission (CPSC):
 - 1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials
- C. Glass Association of North America (GANA):
 - 1. GANA – Glazing Manual.
 - 2. FGMA – Sealant Manual.
- D. National Fire Protection Association (NFPA):
 - 1. NFPA 80: Fire Doors and Windows.
 - 2. NFPA 252 – Fire Tests of Door Assemblies.
- E. Underwriters Laboratories, Inc. (UL):
 - 1. UL 10B – Fire Tests of Door Assemblies.
 - 2. UL 10C – Positive Pressure Fire Tests of Door Assemblies.

1.4 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

1.5 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements.
- C. Product Test Listings: From UL indicating fire-rated glass complies with requirements, based on comprehensive testing of current product.
- D. Additional Submittals:
 - 1. Product Data for Glazing Sealants: Documentation including printed statement of VOC content.
 - 2. Laboratory Test Reports for Glazing Sealants: Documentation indicating that products comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Small-Scale Environmental Chambers."
- E. Glass Samples: For each type of glass product; 12 inches square.
- F. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installers and glass testing agency.
- B. Product Certificates: For each type of glass and glazing product, from manufacturer.

- C. Sample Warranties: For special warranties.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- B. Fire Protective Rated Glass: Each lite shall bear permanent, non-removable label of UL certifying it for use in tested and rated fire protective assemblies.
- C. Fire Protective Glazing Products for Door Assemblies: Products identical to those tested per UL 10B, classified and labeled by UL.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Store off ground, under cover, protected from weather and construction activities.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install fire-resistant glazing until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature conditions at occupancy levels during the remainder of the construction period.

1.11 WARRANTY

- A. Manufacturer's Special Warranty on Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
- B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; deterioration of glazing materials; or other defects in construction.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organization below unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: "Glazing Manual."
- B. Safety Glazing Labeling: Permanently mark glazing with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, glass thickness, and safety glazing standard with which glass complies.

2.4 GLASS PRODUCTS

- A. Laminated Ceramic Glazing.

2.5 FIRE-PROTECTION-RATED GLAZING

- A. Fire-Protection-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on positive-pressure testing according to NFPA 257 or UL 9, including the hose-stream test, and shall comply with NFPA 80.
 - 1. Fire-protection-rated glazing required to have a fire-protection rating of 20 minutes shall be exempt from the hose-stream test.
- B. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name; test standard; whether glazing is permitted to be used in doors

or openings; if permitted in openings, whether or not glazing has passed the hose-stream test; whether or not glazing meets 450 deg F (250 deg C) temperature-rise limitation; and the fire-resistance rating in minutes.

- C. Laminated Ceramic Glazing: Laminated glass made from two plies of clear, ceramic glass; 8-mm total thickness; and complying with 16 CFR 1201, Category II.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide products by the following:
 - a. Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065.
 - 1) FireLite Plus.
 - 2. Substitutions: Requests for substitutions will be considered in accordance with provisions of Section 012500 "Substitution Procedures."

2.6 GLAZING ACCESSORIES

- A. Provide glazing gaskets, glazing sealants, glazing tapes, setting blocks, spacers, edge blocks, and other glazing accessories that are compatible with glazing products and each other and are approved by testing agencies that listed and labeled fire-resistant glazing products with which products are used for applications and fire-protection ratings indicated.
- B. Glazing Sealants for Fire-Rated Glazing Products: One-part neutral curing silicone, medium modulus sealant, Type S; Grade NS; Class 25 with additional movement capability of 50 percent in both extension and compression (total 100 percent); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corp. – Dow Corning 795.
 - b. General Electric Co. - Silglaze-II 2800.
 - c. Tremco Inc. – Spectrem 2.
 - 2. Sealants shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Small-Scale Environmental Chambers."
 - 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- C. Glazing Tapes: Closed-cell, PVC foam tapes; coiled on release paper over adhesive on two sides.
- D. Glazing Compound.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide products by the following:
 - a. DAP Products Inc., 2400 Boston Street, Suite 201, Baltimore, MD 21224.
 - 1) 33 window glazing putty.

- E. Setting Blocks.
 - 1. Neoprene, EPDM, or silicone; tested for compatibility with glazing compound.
 - 1) Shore A Hardness: 70 to 90.

2.7 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

2.8 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with manufacturing and installation tolerances, including those for size, squareness, and offsets at corners, and for compliance with minimum required face and edge clearances.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate fire side and protected side. Label or mark units as needed so that fire side and protected side are readily identifiable. Do not use materials that leave visible marks in the completed work.

3.3 GLAZING

- A. Use methods approved by testing agencies that listed and labeled fire-resistant glazing products.

- B. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials unless more stringent requirements are indicated, including those in referenced glazing publications.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Cut glazing tape to length and set against permanent stops, flush with sight lines to fit openings exactly, with stretch allowance during installation.
- G. Place setting blocks located at quarter points of glass with edge block no more than 6 inches from corners.
- H. Set units of glass in each series with uniformity of pattern, draw, bow, and similar characteristics.
- I. Glaze vertically and push against tape for full contact at perimeter of pane or unit.
- J. Place glazing tape on free perimeter of glazing in same manner described above.
- K. Install removable stop and secure without displacement of tape.
- L. Per fire-rated glazing manufacturer's written instructions, use specified glazing compound where necessary, without adulteration; bed glazing material in glazing compound; entirely fill all recess and spaces. Provide visible glazing compound with smooth and straight edges.
- M. Install in vision panels in fire-rated doors to requirements of NFPA 80.
- N. Install so that appropriate markings remain permanently visible.
- O. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- P. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.4 CLEANING AND PROTECTION

- A. Immediately after installation, remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088813

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 systems for interior gypsum board assemblies.
- B. Related Requirements:
 - 1. Section 092900 "Gypsum Board."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For steel studs and runners, from ICC-ES.

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/A 653M, G40, hot-dip galvanized unless otherwise indicated.

- B. Studs and Runners: ASTM C 645.
 - 1. Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: As indicated on Drawings.
 - b. Depth: As indicated on Drawings.
- C. Slip-Type Head Joints: Where indicated, provide the following:
 - 1. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
 - a. Products: Subject to compliance with requirements, provide products from one of the following:
 - 1) Clarkwestern Dietrich Building Systems LLC.
 - 2) USG Corporation.
 - 3) Telling Industries.

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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames 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 PREPARATION

3.3 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 supplementary framing, and blocking to support door frames, cabinets, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 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.
 - 1. Single-Layer Application: As indicated on Drawings.
- B. Install studs so flanges within framing system point in same direction.
- C. 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 mechanical, electrical, and plumbing work 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; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- D. 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.

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, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Low Emitting Materials: For ceiling and wall assemblies, provide materials and construction identical to those tested in assembly and complying with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 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, provide products by one of the following:
 - 1. USG Corporation.
 - 2. CertainTeed Corp.
 - 3. Georgia-Pacific Gypsum LLC.
 - 4. National Gypsum Company.
 - 5. Temple-Inland.
- B. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.

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.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- 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, 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 setting-type taping compound.
 - 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 - 4. Finish Coat: For third coat, use setting-type, sandable topping 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.
- 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 nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through

perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, provide products from one of the following:
 - a. Pecora Corporation.
 - b. USG Corporation; "Sheetrock" Acoustical Sealant.
2. Substitutions: Requests for substitutions will be considered in accordance with provisions of Section 012500 "Substitution Procedures."
3. Acoustical joint sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 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 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.
- C. 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.
- D. Form control and expansion joints with space between edges of adjoining gypsum panels or between edges of gypsum panels and adjoining dissimilar materials.
- E. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.
- F. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- G. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- H. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- I. 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 in the following locations:
1. Wallboard Type: As indicated on Drawings.
- B. Single-Layer Application:
1. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 2. 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 at locations indicated on Drawings.
- C. Interior Trim:
 - 1. Cornerbead: Use at outside corners.
 - 2. LC-Bead.
 - 3. L-Bead.
 - 4. U-Bead.

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, 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:
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

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 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. Related Requirements:
 - 1. Section 079219 "Acoustical Joint Sealants."

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.
- C. Samples for Initial Selection: For components with factory-applied color finishes.
- D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of full-size Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch-long Samples of each type, finish, and color.

1.5 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. Items penetrating finished ceiling including, but not limited to, the following:
 - a. Lighting fixtures.
 - b. Sprinklers.
 4. Perimeter moldings.
- B. Qualification Data: For testing agency.
- C. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.
- E. Field quality-control reports.
- 1.6 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For finishes to include in 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. Acoustical Ceiling Panels: Full-size panels equal to 3 percent of quantity installed.
 2. Suspension-System Components: Quantity of each exposed component equal to 3 percent of quantity installed.
- 1.8 QUALITY ASSURANCE
- A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.
- 1.9 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.

1.10 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.

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: 50 or less.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Low-Emitting Materials: Acoustical panel ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.
- C. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.
- D. 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 15-3/4 inches away from test surface according to ASTM E 795.
- E. 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 PANELS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products by the following:
 - 1. Ceiling Type C100: Armstrong Ceiling Solutions.
 - a. Optima 9/16-inch, square tegular ceiling panels.
 - 1) Size: 24 inches x 48 inches x 1 inch thick.
 - 2. Ceiling Type C200: Armstrong Ceiling Solutions.
 - a. Optima 9/16-inch, square tegular ceiling panels.
 - 1) Size: 24 inches x 24 inches x 1 inch thick.
- B. Substitutions: Requests for substitutions will be considered in accordance with provisions of Section 012500 "Substitution Procedures."
- C. Color: White.
- D. 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.

2.4 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/C 635M.
- B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, 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/A 641M, Class 1 zinc coating, soft temper.
 - 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch-diameter wire.

2.5 METAL SUSPENSION SYSTEM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products by the following:
 - 1. Armstrong Ceiling Solutions.
 - a. Suprafine XL, 9/16-inch face.
 - 1) Provide grid with "TrioGuard" coating.
- B. Substitutions: Requests for substitutions will be considered in accordance with provisions of Section 012500 "Substitution Procedures."
- C. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation; with prefinished 9/16-inch-wide metal caps on flanges.
 - 1. Structural Classification: Intermediate-duty system.
 - 2. End Condition of Cross Runners: Override (stepped) type.
 - 3. Face Design: Flat, flush.
 - 4. Cap Material: Steel cold-rolled sheet.
 - 5. Cap Finish: Painted white.

2.6 METAL EDGE MOLDINGS AND TRIM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products by the following:
 - 1. Armstrong Ceiling Solutions.
- B. Roll-Formed, Sheet-Metal Edge Moldings: 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.

2.7 ACOUSTICAL SEALANT

- A. Acoustical Sealant: See Section 079219 "Acoustical Joint Sealants."

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/C 636M 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 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 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. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger

- involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or steel deck. Fasten hangers to postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 7. 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.
 8. Do not attach hangers to steel deck tabs.
 9. Do not attach hangers to steel deck. Attach hangers to structural members.
 10. 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.
 11. 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 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 postinstalled 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 tegular-edged panels on suspension-system members, where panels must be cut to fit, cut edges in tegular shape to match manufactured tegular edges.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

- B. Testing agency shall perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations show compliance with requirements.
 - 1. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.
 - a. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
 - b. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- C. Acoustical panel ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.5 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. Additional Submittals:
 - 1. Product Data for Adhesives: Documentation including printed statement of VOC content.
 - 2. Laboratory Test Reports for Adhesives: Documentation indicating that products comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.
- D. Samples for Initial Selection: For each type of product indicated.
- E. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.
- F. 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Low-Emitting Materials: Base-and-accessories system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 VINYL BASE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
 - 2. Johnsonite.

3. Roppe Corporation, USA.
 4. VPI, LLC; Floor Products Division.
- B. Product Standard: ASTM F 1861, Type TV (vinyl, thermoplastic).
1. Group: I (solid, homogeneous).
 2. Style and Location:
 - a. Style B, Cove.
- C. Minimum Thickness: 0.125 inch.
- D. Height: 4 inches.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed.
- G. Inside Corners: Job formed.
- H. Colors and Patterns: As selected by Architect from full range of industry colors.

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.
 2. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

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.

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. Do not use solvents.

B. 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.

C. 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. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Form without producing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Miter corners to minimize open joints.

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.

END OF SECTION 096513

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 interior substrates.
- B. Related Requirements:
 - 1. Section 099200 "Concrete Floor Paints."
 - 2. Section 099300 "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on interior wood substrates.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Indicate VOC content.
- B. Additional Submittals:
 - 1. Product Data for Paints and Coatings: Documentation including printed statement of VOC content.
 - 2. Laboratory Test Reports for Paints and Coatings: Documentation indicating that products comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Samples for Initial Selection: For each type of topcoat product.
- D. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Step 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.
- E. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Basis of Design: Benjamin Moore & Co.
 2. PPG Architectural Finishes, Inc.
 3. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.
- D. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Colors: Match Architect's samples.
 - 1. Thirty percent of surface area will be painted with deep tones.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner will engage the services of a qualified testing agency to sample wood finishing materials. Contractor will be notified in advance and may be present when samples are taken. If 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 wood finishes if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying materials from Project site, pay for testing, and refinish surfaces finished with rejected materials. Contractor will be required to remove rejected materials from previously finished surfaces before refinishing with complying materials if the two finishes are incompatible or produce results that, in the opinion of the Architect, are aesthetically unacceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Fiber-Cement Board: 12 percent.
 - 3. Masonry (Clay and CMUs): 12 percent.
 - 4. Wood: 15 percent.
 - 5. Gypsum Board: 12 percent.
 - 6. Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. 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 and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel and Iron Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.

- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Wood Substrates:
 - 1. Wood shall have no knots.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

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:
 - 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. Other items as directed by Architect.
2. Paint portions of internal surfaces of 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. Institutional Low-Odor/VOC Latex System:

- a. Block Filler: Block filler, latex, interior.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC. Gloss level as selected by Architect.
- B. Steel and Iron Substrates:
- 1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Primer, rust inhibitive, water based.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC. Gloss level as selected by Architect.
- C. Galvanized-Metal Substrates:
- 1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Primer, galvanized, water based.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC. Gloss level as selected by Architect.
- D. Wood Substrates: Including trim and plywood.
- 1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Primer, latex, for interior wood.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC. Gloss level as selected by Architect.
- E. Gypsum Board Substrates:
- 1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.

- c. Topcoat: Latex, interior, institutional low odor/VOC. Gloss Level as selected by Architect.

END OF SECTION 099123

SECTION 099200 – CONCRETE FLOOR PAINTS

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 concrete floor paint treatments for the following horizontal surfaces:
 - 1. Cast-in-place concrete.
- B. Related Requirements:

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's printed statement of VOC content.
 - 2. Include manufacturer's standard colors.
 - 3. Include manufacturer's recommended number of coats for substrate and spreading rate for each separate coat.
- B. Samples: For each type and color of concrete floor paint and substrate indicated, 12 by 12 inches in size, with specified water-repellent treatment applied to half of each Sample.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Applicator.
- B. Product Certificates: For concrete floor paint and non-skid texture additive.
- C. Field quality-control reports.

- D. Sample Warranty: For special warranty.

1.6 QUALITY ASSURANCE

- A. Applicator Qualifications: An employer of workers trained and approved by manufacturer. Applicator shall have successfully performed a minimum of 5 projects of similar scope and complexity.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original containers, with seals unbroken, bearing manufacturer labels indicating brand name and directions for storage.
- B. Store concrete floor paint in environment recommended on published manufacturer's product data sheets.
 1. Store containers upright in a cool, dry, well-ventilated place, out of the sun with temperature between 40 and 100 degrees F (4 and 38 degrees C).
 2. Protect from freezing.
 3. Store away from other chemicals and potential sources of contamination.
 4. Keep lights, fire, sparks and heat away from containers.
 5. Do not drop containers or slide across sharp objects.
 6. Do not stack pallets more than three high.
 7. Keep containers tightly closed when not in use.

1.8 FIELD CONDITIONS

- A. Limitations: Proceed with application only when the existing and forecasted weather and substrate conditions permit concrete floor paint to be applied according to manufacturers' written instructions and warranty requirements.
 1. Provide temporary heat when necessary to comply with manufacturer's recommendations.
 2. Do not apply concrete floor paint until no less than 24 hours have passed since surfaces were last wet.
 3. Ventilation: Provide ventilation during concrete floor paint evaporation stage in accordance with manufacturer's written instructions.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer and Applicator agree to repair or replace materials that fail within specified warranty period. Failures include, but are not limited to, cracking, spalling, and crazing.
 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FLOOR PAINTS

- A. Epoxy Ester/Acrylic Floor Paint: Pigmented coating of epoxy ester/acrylic blend; with 50 g/L or less of VOCs.
 - 1. Basis-of-Design Products: Subject to compliance with requirements, provide products from the following:
 - a. United Gilsonite Laboratories, 1396 Jefferson Avenue, Dunmore, PA, 18509.
 - 1) Drylok E1 1-part epoxy floor paint.
 - a) Color: As selected by Architect from manufacturer's full range.
- B. Non-Skid Texture Additive: Non-skid texture additive added to epoxy floor paint.
 - 1. Basis-of-Design Products: Subject to compliance with requirements, provide products from the following:
 - a. United Gilsonite Laboratories, 1396 Jefferson Avenue, Dunmore, PA, 18509.
 - 1) Drylok Non-Skid texture Additive.
- C. Substitutions: Requests for substitutions will be considered in accordance with provisions of Section 01635 "Substitution procedures.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.
 - 1. Verify that surfaces are clean and dry according to concrete floor paint manufacturer's requirements. Check moisture content in two representative locations by method recommended by manufacturer.
 - 2. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of concrete floor paint.
 - 3. Verify that required repairs are complete, cured, and dry before applying concrete floor paint.
- B. Test pH level according to concrete floor paint manufacturer's written instructions to ensure bond.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cleaning: Before application of concrete floor paint, clean substrate of substances that could impair penetration or performance of product according to concrete floor paint manufacturer's written instructions and as follows:
 - 1. Cast-in-Place Concrete: Remove oil, curing compounds, laitance, and other substances that inhibit penetration or performance of concrete floor paint.
- B. Mechanically scarify concrete according to manufacturer's written instructions prior to applying concrete floor paint. Do not proceed with application until a factory-authorized service representative approves substrate condition.
- C. Protect adjoining work from spillage of concrete floor paint. Cover adjoining and nearby surfaces if there is the possibility of concrete floor paint being deposited on surfaces.

3.3 APPLICATION

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of concrete floor paint and to instruct Applicator on the product and application method to be used.
- B. Apply two coats of concrete floor paint combined with non-skid texture additive on surfaces to be treated using methods as recommended by manufacturer in writing. Apply second coat in a cross direction to first coat to achieve color uniformity.

3.4 CLEANING

- A. Immediately clean concrete floor paint from adjoining surfaces and surfaces soiled or damaged by concrete floor paint application as work progresses. Correct damage to work of other trades caused by concrete floor paint application, as approved by Architect.
- B. Comply with manufacturer's written cleaning instructions.

END OF SECTION 099200

SECTION 099300 - STAINING AND TRANSPARENT FINISHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and application of wood stains and transparent finishes on the following substrates:
 - 1. Interior Substrates:
 - a. Dressed lumber (finish carpentry or woodwork).
 - b. Plywood.
 - c. Flush wood doors.
- B. Related Requirements:
 - 1. Section 099123 "Interior Painting."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.
- B. Additional Submittals:
 - 1. Product Data for Interior Stains and Coatings: Documentation including printed statement of VOC content.
 - 2. Laboratory Test Reports for Interior Stains and Coatings: Documentation indicating that products comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

- C. Samples for Initial Selection: For each type of product.
- D. Samples for Verification: For each type of finish system and in each color and gloss of finish required.
 - 1. Submit Samples on representative samples of actual wood substrates, 8 inches square or 8 inches long, according to location of wood in the Work.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- E. Product List: Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Stains and Transparent Finishes: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

- A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply finishes when relative humidity exceeds 85 percent, at temperatures less than 5 deg F above the dew point, or to damp or wet surfaces.
- C. Do not apply exterior finishes in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Benjamin Moore & Co.
 2. ICI Paints.
 3. Parex LaHabra Inc.
 4. Pratt & Lambert.
 5. Sherwin-Williams Company (The).

2.2 MATERIALS, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products List."
- B. Material Compatibility:
 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, products shall be recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.
- D. Low-Emitting Materials: Interior stains and finishes shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Stain Colors: Match Architect's samples.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Materials: Owner reserves the right to invoke the following procedure:
 1. Owner will engage the services of a qualified testing agency to sample wood finishing materials. Contractor will be notified in advance and may be present when samples are taken. If 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 wood finishes if test results show materials being used do not comply with product requirements. Contractor shall

remove noncomplying materials from Project site, pay for testing, and refinish surfaces finished with rejected materials. Contractor will be required to remove rejected materials from previously finished surfaces before refinishing with complying materials if the two finishes are incompatible or produce results that, in the opinion of the Architect, are aesthetically unacceptable.

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 Interior Wood Substrates: 10 percent, when measured with an electronic moisture meter.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with finish application only after unsatisfactory conditions have been corrected.
 - 1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
 - 1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each substrate condition and as specified.
 - 1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
 - 2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.

D. Interior Wood Substrates:

1. Wood shall be free of knots.
2. Apply wood filler paste to open-grain woods, as defined in "MPI Architectural Painting Specification Manual," to produce smooth, glasslike finish.
3. Sand surfaces exposed to view and dust off.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dry.

3.3 APPLICATION

- A. Apply finishes according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
1. Use applicators and techniques suited for finish and substrate indicated.
 2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
 3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.5 INTERIOR WOOD-FINISH-SYSTEM SCHEDULE

- A. Wood Substrates: Wood trim, architectural woodwork, doors, and plywood paneling.
- B. Grade: Architectural Woodwork Institute (AWI) Custom Grade.
- C. System:

1. AWI TR-6 Catalyzed Polyurethane System.
 - a. Gloss and sheen as selected by Architect.

END OF SECTION 099300

SECTION 210500 – COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART I - 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 INTENT

- A. It is the intent of the Specifications and Drawings to call for finished work, tested and ready for operation.
- B. 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 as determined by good trade practice even if not particularly specified, shall be furnished, delivered and installed under their respective Divisions without any additional expense to the Owner.
- C. Minor details not usually shown or specified but necessary for proper installation and operation shall be included in the work as though they were hereinafter shown or specified.
- D. Work under each Section shall include giving written notice to the UCHC Agent 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.

1.3 DEFINITIONS

- A. "Architect" means Patriquin Architects, New Haven, CT 06513.
- B. "Engineer" means Acorn Consulting Engineers, Inc., West Simsbury, CT 06092
- C. "regulating authorities" or "authorities", means all Governmental, Utility, and Insuring Authorities having jurisdiction.
- D. "Subcontractor" word means specifically the subcontractor working under this Division. Other Contractors are specifically designated "Plumbing Subcontractor", "General Contractor" and so on.
- E. Note: Take care to ascertain limits of responsibility for connecting equipment which requires connections by two or more trades.
- F. Word "install" shall mean set in place complete with all mounting facilities and connections

as necessary ready for normal use or service.

- G. Words “furnish” or “supply” shall mean purchase, deliver to, and off-load at the job site, all ready to be installed including where appropriate all necessary interim storage and protection.
- H. Word “provide” shall mean furnish (or supply) and install as necessary.
- I. Word “finished” refers to all rooms and areas scheduled to be painted in Room Finish Schedule on the drawings. All rooms and areas not covered in Schedule, including underground tunnels and areas above ceilings shall be considered not finished, unless otherwise noted.
- J. Words “approved equal” mean any product which in the opinion of the UCHC Agent is equal in quality, arrangement, appearance, and performance to the product specified.
- K. Word “wiring” shall mean cable assembly, raceway, conductors, fittings and any other necessary accessories to make a complete wiring system.
- L. Word “product” shall mean any item of equipment, material, fixture, apparatus, appliance or accessory installed under this Division.

1.4 DRAWINGS

- A. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. 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. (Do not scale the drawings)
- B. Work under each Section shall 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, UCHC Agent shall be notified before proceeding with installations.
- C. The UCHC Agent 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, the item or arrangement of better quality, shall be included in the Contract price. The UCHC Agent 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. The 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. The Contractor shall base all measurements, both horizontal and vertical, from established

bench marks. 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 which interfere with the intent of the Drawings and Specifications, the UCHC Agent will be notified and work will not proceed until instructions from the UCHC Agent are received.
- D. All existing ductwork under the footprint of this project and back to the main duct shall be cleaned as part of this project by the contractor.
- E. All existing heating, cooling and reheat coils under the footprint of this project and back to the main duct shall be cleaned (wire brushed) as part of this project by the contractor.
- F. All existing reheat valves and controls providing conditioned air for this project shall be replaced as part of the project by the contractor.

1.6 CODES AND STANDARDS

- A. The Following Codes and Standards listed below apply to all mechanical work. Wherever Codes and/or Standards are mentioned in these Specifications, the latest applicable edition or revision shall be followed:

Connecticut State Building Code - Connecticut Supplement
The BOCA National Building Code
The BOCA National Mechanical Code
The BOCA National Plumbing Code
The BOCA National Code Supplement
The National Electrical Code

- B. 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	Air Conditioning and Refrigeration Institute
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	Environmental Protection Agency
FSSC	Federal Specification
HIS	Hydraulic Institute Standards
IBR	Hydraulic Institute Standards
IEEE	Institute of Electrical and Electronics Engineers
IRI	Industrial Risk Insurers
ISO	Insurance Services Office
MCAA	Mechanical Contractors Association of America
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
NSC	National Safety Council
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
PDI	Plumbing and Drainage Institute
SBI	Steel Boiler Industry (Division of Hydronics Institute)
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
STI	Steel Tank Institute
UL	Underwriters' Laboratories

- C. 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.
- D. The Contractor shall 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 shown on Drawings and/or specified or not.

1.7 PERMITS AND FEES

- A. The Contractor shall give all necessary notices, obtain all permits; and 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 inspection for his work, and deliver a copy to the UCHC Agent before request for acceptance and final payment for the work.

1.8 COORDINATION WITH OTHER DIVISIONS

- A. All work shall be carried out in conjunction with other trades and full cooperation shall be given 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 Contractor or Construction Manager, with information as to openings, chases, sleeves, bases, inserts, equipment locations, panels, etc., required by other trades.

- B. The Contractors are required to examine all of the Project Drawings and mutually arrange work so as to avoid interference with the work of other trades. In general, ductwork-, heating, condenser, chilled water piping, sprinkler piping and drainage lines take precedence over water, gas and electrical conduits. The UCHC Agent shall make final decisions regarding the arrangement of work which cannot be agreed upon by the Contractors.
- C. Where the work of the Contractor will be installed in close proximity to or will interfere with work of other trades, the Contractors will cooperate in working out space conditions to make a satisfactory adjustment.
- D. If the work under a Section is installed before coordinating with other Divisions or Sections or so as to cause interference with work of other Sections, the necessary changes to correct the condition shall be made by the Contractor causing the interference without extra charge to the Owner.
- E. If so directed in other Sections, the Contractor indicated shall prepare composite working drawings and sections clearly showing how the work is to be installed in relation to the work of other trades, at no extra charge to the Owner.

1.9 ACCEPTANCES

- A. The equipment, materials, workmanship, design and arrangement of all work installed under the Mechanical Sections shall be subject to the review of the UCHC Agent.
- B. Within 30 days after the awarding of a Contract, the Mechanical Contractor shall submit to the UCHC Agent, for review, a list of manufacturers of equipment proposed for the work under the Mechanical Sections. The intent to use the exact makes specified does not relieve the Contractor of the responsibility of submitting such a list.

If extensive or unacceptable delivery time is expected on a particular item of equipment specified, the Contractor shall notify the UCHC Agent, in writing, within 30 days of the awarding of the Contract. In such instances, deviations may be made pending acceptance by the UCHC Agent 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 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, the Mechanical Contractor shall 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 it is reviewed, the Contractor shall be liable for its removal and replacement at no extra charge to the Owner if, in the opinion of the UCHC Agent, the material or equipment does not meet the intent of, or standard of quality implied by, the Drawings and Specifications.
- E. Failure on the part of the UCHC Agent 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. Work not in conformance with the Drawings and/or Specifications shall be corrected whenever it is discovered.

1.10 EQUIPMENT DEVIATIONS/SUBMITTALS

- A. 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 Mechanical Base Bid with manufacturer's equipment cuts. The Base Bid shall be based on using the materials and equipment as specified with no exceptions.
- B. In these Specifications and on the accompanying Drawings, one 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. 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 Engineers review.
- D. Where two or more names are given as equivalents, the Contractor must use the specified item or one of the named equivalents. Where one 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 Item 1.09, Paragraph B.
- E. Equipment, material or devices submitted for review as an "equivalent" shall meet the following requirements:

The equivalent shall have the same construction features such as, but not limited to:

Material thickness, gauge, weight, density, etc.

Welded, riveted, bolted, etc., construction

Finish, undercoating, corrosion protection

The equivalent shall perform with the same or better operating efficiency.

The equivalent shall be locally represented by the manufacturer for service, parts and technical information.

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 UCHC Agent, 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 UCHC Agent shall determine if an “acceptable equivalent” to a manufacturer listed in the Specifications is considered acceptable.
- I. All mechanical submittals shall be submitted using the following format. If equipment to be used on project is as specified (manufacturer, model #, etc. the same) then no cut sheets are required. If equipment to be used on project is different than specified, then a cut sheet of equipment to be used shall be submitted along with an explanation of the difference between specified equipment and equipment requested to be used and the reason why the deviation. Submittals will only be accepted on a 8.5 X 11 sheet of paper with three (3) columns with the following headings: “SPECIFIED EQUIPMENT DISCRIPTION”, “EQUIPMENT REQUESTED DISCRIPTION”, AND “REASON FOR DIFFERENCE”. If contractor is using equipment as specified, he would list equipment under “Specified Equipment Description” and under “Equipment Requested Description” he would put “Same as Specified” and continue with next piece of equipment.

1.11 CHANGES IN WORK

- A. 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 12.

1.12 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 Subcontractor 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.

1.13 SHOP DRAWINGS

- A. 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.

- B. Shop drawings shall be submitted within 60 days after award of Contract before any material or equipment is purchased. The Contractor shall submit for review copies of all shop drawings to be incorporated in the Mechanical Contract. Refer to the General Conditions and Supplementary General Conditions for the quantity of copies required for submission. Where quantities are not specified, provide seven (6) copies for review.
- C. Provide shop drawings for all devices specified under equipment specifications for all systems including fire alarm, sprinkler, clock, controls, etc., or where called for elsewhere in the Specifications. 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 UCHC Agent at one time. No consideration will be given to a partial shop drawing submittal.
- D. Submittals shall be marked with the trade involved, i.e., HVAC, plumbing, fire protection, etc. when the submittal could involve more than one trade, e.g., valves, piping, etc.

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.

- E. 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 UCHC Agent.
- F. 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.
- G. Acceptance rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are reviewed, review does not mean 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.
- H. Acceptance of shop drawings shall not apply to quantity nor relieve Contractor of his responsibility to comply with intent of Drawings and Specifications.

Acceptance of shop drawings is final and no further changes will be allowed without the written consent of the UCHC Agent.

- J. 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.

- K. Bidders shall not rely on any verbal clarification of the Drawings and/or Specifications. Any questions shall be referred to the UCHC Agent at least five (5) working days prior to Bidding to allow for issuance of an Addendum.

1.14 RECORD DRAWINGS

- A. Maintain at the job site a record set of Mechanical Drawings on which any changes in location of equipment, piping, ducts, valves, clean outs and access panels shall be recorded. These shall be clearly marked for Record Drawings- on a clean set of reproducible mylar sepias at the completion of the work and turned over to the UCHC Agent.

1.15 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 UCHC Agent 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 UCHC Agent 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.

1.16 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. Insure that all electrical or absorbent equipment or material is protected from moisture during storage.

1.17 BASES AND SUPPORTS

- A. Unless otherwise specifically noted, the Mechanical 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, compressors and other rotating machinery shall be mounted on a minimum of four (4") inch high concrete pads. All pads shall be extended six (6") inches beyond machine base in all directions with top edge chambered. Shop drawings of all foundations and pads shall be submitted to the UCHC Agent for review before they are constructed. The Mechanical Contractor shall furnish to the 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 UCHC Agent 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.

1.18 SLEEVES, INSERTS AND ANCHOR BOLTS

- A. The Mechanical 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 Mechanical Contractors expense.

It is the responsibility of the Mechanical 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 Structural UCHC Agent for alternate installation methods.

- B. All pipes and conduits passing through floors, walls or partitions shall be provided with sleeves having an inside diameter one (1") inch larger than the outside diameter of the pipe, conduit or insulation enclosing the pipe.

Hot, cold or chilled water or high pressure steam piping shall run with insulation continuous

through sleeve.

- C. Penetrations through fire-rated walls, ceilings and 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.

1.19 CUTTING AND PATCHING

- A. All cutting and patching shall be done by the Contractor. 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 shall be cut without the written acceptance of the Structural UCHC Agent and all such cutting shall be done in a manner directed by him.

1.20 SCAFFOLDING, RIGGING, 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.

1.21 EXCAVATION AND BACKFILLING

- A. Excavation and backfilling shall be carried out under Division 2 of the Specifications, unless otherwise indicated in individual trade Sections.
- B. It is the responsibility of the Mechanical Contractor to coordinate sizes, depths, fill and bedding requirements with the Division 2 Contractor and any other excavation work required under this Division.

1.22 WATERPROOFING

- A. Where any work pierces waterproofing, including waterproof concrete and floors in wet areas, the method of installation shall be reviewed by the UCHC Agent before work is done. The Contractor shall furnish all necessary sleeves, caulking and flashing required to make openings absolutely watertight.

1.23 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 UCHC Agent.
- C. Access doors in walls, ceilings, floors, etc., shall be furnished by the appropriate Subcontractor and installed by the Contractor. It is the responsibility of the Mechanical 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. Minimum access door size is 18" X 18".
- D. On a clean set of prints, the plumbing, HVAC and fire protection Contractors 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 by the Contractor.

1.24 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 notify the Contractor or the Construction Manager 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.

1.25 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 UCHC Agent.
- B. The UCHC Agent 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 actually required to make necessary connections.

1.26 TAGS AND CHARTS

- A. Each valve and piece of apparatus under this Division shall be provided with suitable brass or laminated plastic tags securely fastened with brass chains, screws or rivets. Equipment shall be numbered with laminated plastic tags or neatly stenciled letters two (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 provided to the UCHC Agent for approval.

1.27 ESCUTCHEONS

- A. The Contractor shall provide escutcheons on pipes wherever they pass through floors, ceilings, walls or partitions in visible locations.

1.28 COLOR-CODING AND PIPING IDENTIFICATION

- A. All piping, controls, tanks, tubing, etc., shall be color-coded for quick identification in conformance with the following: Oxygen – Green; Res. Compressed Air – Yellow; medical Suction – White; Nitrous Oxide – Blue; Nitrogen – Black.
- B. All piping shall be color-coded with semi-rigid plastic identification markers, Seton Setmark Type "SNA", Type "STR" or equivalent. Direction of flow arrows shall be included on each marker. On all horizontal pipe runs, the markers shall be installed 25 feet apart or less. Also, locate markers at wall penetrations, valves, changes in direction and at branch main take-offs.
- C. The background color of each identification marker shall also be color coded in conformance with ANSI A13.1.
- D. All identification markers are subject to UCHC Agents review prior to installation. See individual trade Sections for further requirements.

1.29 PAINTING

- A. All finish painting in completed areas shall be performed under Division 9 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 Sheet Metal 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. All exterior piping, fittings and hangers shall be properly primed and finished with a minimum of two (2) coats of high grade exterior enamel.
- E. All HVAC piping in Mechanical Equipment Room shall be painted with a suitable paint.

Colors shall be in accordance with ANSI Standard A 13. 1.

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. Swing joints, expansion loops and expansion joints with proper anchors and guides shall be provided by the Contractor where necessary and/or where shown on the Drawings. Anchors and guides shall be subject to the review of the UCHC Agent. Pay particular attention to plastic piping with high coefficients of expansion.

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 under Division 16.
- B. All power wiring shall be furnished and installed complete from power source to motor or equipment junction box including power wiring through the starters. All starters not factory mounted on equipment shall be installed under Division 16.
- C. When specified, the Contractor shall furnish and install all temperature control wiring, interlock wiring and equipment control wiring for the equipment furnished under this Division.
- D. The Contractor shall furnish starters to the Electrical Contractor where specified. The Contractor shall provide and be responsible for the heaters in all starters that he furnishes.

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. 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 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.
- D. 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.
- E. The Contractor shall check all controls in the building to ascertain that they are functioning as designed. This shall apply to all thermostats, aquastats, humidistats, freeze-stats and fire-stats, etc. This portion of the work shall be performed by the Contractor who installed the controls.
- F. During construction, the Contractor shall ensure that all filters are in place on all equipment. If the equipment is operated during construction, strict attention shall be paid to maintaining clean and effective filters. Filters shall be new and clean when the system testing and balancing takes place. The Contractor shall bear the cost of all filters and media during construction until final acceptance by the Owner. This requirement shall apply equally to fluid filters and strainers.
- G. 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.).
- H. All existing ductwork under the footprint of this project and back to the main duct shall be cleaned as part of this project by the contractor.
- I. All existing heating, cooling and reheat coils under the footprint of this project and back to the main duct shall be cleaned (wire brushed) as part of this project by the contractor.
- J. All existing reheat valves and controls providing conditioned air for this project shall be replaced as part of the project by the contractor.

1.34 DEMOLITION

- A. All required demolition work shall be performed by the respective mechanical trades. All demolition work shall be performed in a neat and orderly fashion.
- B. After piping, ductwork, equipment, etc., has been removed, neatly cap remaining ductwork and piping, and insulate caps to match the existing adjacent ductwork and piping. In finished areas, all ductwork and piping shall be cut back to a concealed location, i.e., within walls, above ceilings, etc., before capping.
- C. Before submitting his Bid, the Contractor shall visit the site with Architectural and

Mechanical Plans in hand, and shall inspect all existing systems to determine the extent of demolition work involved. Particular attention is drawn to the removal of existing walls or portions of existing walls. In those areas, all exposed and concealed piping, ductwork, equipment, etc., running across or through affected areas shall be removed as required. Piping and ductwork shall then be either capped, or, if required for the proper continuing operation of an existing system to remain, piping and ductwork shall be rerouted around the affected areas and reconnected as required.

- D. In general, it shall be the responsibility of the Mechanical Contractor to remove demolished equipment, piping, ductwork, etc., from the site and properly dispose of it. If the Owner shall so request, however, the Contractor shall turn over demolished equipment, etc., to the Owner for the Owner's use.

1.35 AIR ELIMINATION

- A. The Contractor shall be responsible for bleeding all air from closed water piping systems after the system has been filled, and thereafter re-bleeding as often as required to completely eliminate all air from the system.
- B. Where work on an existing piping system has allowed air to enter that system, the Contractor shall also bleed that system even if no piping work was done in the area where air has developed.
- C. Where air cannot be bled from any piping due to the absence of an air vent, the Contractor shall install a manual air vent in locations required to successfully bleed such air.
- D. Where the piping layout would require an air vent in an inaccessible location, the Contractor shall install an extended ¼-inch copper bleed line and petcock to an accessible location such as a closet, mechanical room, above lay-in ceiling, etc.

1.36 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.

1.37 CLEANING

- A. The Contractor shall thoroughly clean and flush all piping, ducts and equipment of all foreign substances, oils, burrs, solder, flux, etc., inside and out before being placed in operation.

- B. 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 in the course of removing obstructions shall be repaired or replaced when the system is reconnected at no additional cost to the Owner.
- C. 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.
- D. 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.
- E. All existing ductwork under the footprint of this project and back to the main duct shall be cleaned as part of this project by the contractor.
- F. All existing heating, cooling and reheat coils under the footprint of this project and back to the main duct shall be cleaned (wire brushed) as part of this project by the contractor
- G. All existing reheat valves and controls providing conditioned air for this project shall be replaced as part of the project by the contractor.

1.38 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, the contractor shall have a factory authorized representative, for each piece of equipment, 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 seven (7) days notice to the Owner and the UCHC Agent in advance of this period.
- B. The Contractor shall furnish to the Contractor for delivery to the UCHC Agent four (4) 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. Manufacturers advertising literature or catalogs will not be acceptable for operating and maintenance instruction.
- 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 properly installed prior to startup of any major equipment. The following equipment will require this inspection: pumps; air conditioning equipment, controls, air handling equipment, compressors, boilers etc. These letters will be bound into the operating and maintenance books.

- F. Refer to individual trade Sections for any other particular requirements related to operating instructions.

1.39 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 so as to assure the UCHC Agent that they are in proper adjustment and in satisfactory, permanent operating condition.
- B. Where requested by the UCHC Agent, a factory-trained service 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 representative shall supervise the initial operation of the equipment and instruct the personnel responsible for operation and maintenance of the equipment. The service 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.

1.40 GUARANTEES/WARRANTIES

- A. The Contractor shall guarantee all material and workmanship under these Specifications and the Contract for a period of one (1) year from the date of final acceptance by Owner.
- B. During this guarantee period, all defects developing through faulty equipment, materials or workmanship shall be corrected or replaced immediately by this Contractor without expense to the Owner. Such repairs or replacements shall be made to the Engineers satisfaction.
- C. Contractor shall provide name, address, and phone number of all contractors and subcontractors and associated equipment they provided
- D. A 15 minute telephone response time and a 2 hour on site response time is required for all equipment service. All equipment service shall be performed by factory trained technicians.

END OF SECTION 210500

SECTION 211300 - WET & DRY SPRINKLER SYSTEMS

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 WORK INCLUDED

- A. Complete wet pipe sprinkler system, including all required accessories.
- B. Alarm check valve.
- C. Fire department connection.
- D. Sprinklers.
- E. Fire protection specialties.
- F. System design, installation, and certification.
- G. Sprinkler system and devices signage.
- H. Hangers and supports for sprinkler installation.
- I. Reduced Pressure Detector Assembly.
- J. Sprinkler drain line splash block.
- K. 6 inch fire service
- L. Post indicator valve (As required)

1.3 RELATED WORK

- A. Section - Trench Excavation.
- B. Section 210000 - Common Work Results for Fire Suppression.
- C. Section 230550 - Common Work Results for HVAC
- d. Section 233000 - Basic Materials and Methods.

- D. Section 283102 - Fire Alarm System.
- E. All Other Sections of Division 23 and 28.

1.4 REFERENCES

- A. NFPA 13 - Installation of Sprinkler Systems, 2010 Edition.
- B. 2012 Connecticut State Fire Code (CSFSC) with 2016 Amendments.
- C. "International Building Code" 2012 Edition (With 2016 Amendments).
- D. NFPA 220 - Types of Building Construction, 2010 Edition.

1.5 SYSTEM DESCRIPTION

- A. Sprinkler system to provide complete coverage for the Entire Building.
- B. 6 inch fire service from water main in street to new fire service equipment room at the ground floor.
- C. The piping layout and head locations indicated on the Contract Drawings are diagrammatic. The Contractor is responsible for a complete, fully coordinated installation.
- D. Coordinate existing structural elements and building construction for adequate coverage.
- E. Provide fire department connections and all valves, switches and accessories.
- F. Interface system components with new fire alarm system.
- G. System shall be designed to meet NFPA 13 and NFPA 24 Standards, Engineer's requirements, Fire Marshal's requirements, and Owner's insurance underwriter.

1.6 QUALITY ASSURANCE

- A. Workmanship and Qualifications: All materials and equipment shall be installed in accordance with NFPA Standard 13 and all applicable local codes and ordinances. The sprinkler subcontractor shall be state licensed to install sprinkler system. All work and materials must conform to the requirements set forth by this Specification. Fire protection equipment shall be installed to conform to NFPA Standard 13 as applicable, and devices used shall be listed and approved by Underwriters Laboratories (UL) and/or Factory Mutual (FM). Welding shall be in accordance with NFPA Standard 13 by certified welders.
- B. Codes and Standards: All work shall be equal or superior to that required by codes, regulations, ordinances, and laws imposed by the jurisdictional authorities. Nothing in the Specifications permit violation of such directives, and where conflict occurs, the directive shall govern, except where superior work is specified or indicated.

- C. In addition to complying with the above codes and regulations, comply with the requirements of the following:
 - 1. NFPA Standard 13.
 - 2. NFPA Standard 24.
 - 3. State Building and Fire Codes.
 - 4. Local Jurisdictional Authorities.
- D. Maintain one copy of document on site and record all changes "as-built".

1.7 HYDRAULICALLY DESIGNED SYSTEM

- A. The pipe sizing and arrangement shown on the Contract Drawings are generally diagrammatic. The Contractor shall submit for approval a hydraulically designed system in according to the applicable requirements of NFPA-13 and the Project Specifications.
- B. Hydraulically designed system shall include calculations and detailed layout showing all hydraulic reference nodes. The requirements established under section 14.1 "Working Plans" and 14-3 "Hydraulic Calculation Forms" of NFPA-13 shall be followed.
- C. Calculations shall include a summary sheet, detailed work sheets, and water supply graph sheets for each set of calculations.
- D. The design area(s) shall be the most hydraulically demanding based on the criteria of NFPA-13. Submit an additional two sets of calculations for a gridded system.
- E. Include loss through the reduced pressure detector assembly based on manufacturer's publicized data.
- F. The design velocities shall be kept to a minimum. The design maximum shall be 20 fps. Contractor shall also verify any local design requirements or restrictions.
- G. Hydraulically designed system must meet the approval of the Fire Marshal and the Owner's insurance underwriter.
- H. All drawings and calculations must bear the seal of a professional engineer, licensed in the State of Connecticut.

1.8 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 210500.
- B. Submit manufacturer's data, drawings, and installation instructions for all equipment and specialties.
- C. Submit hydraulic calculations with all information required under NFPA 13.
- D. Submit installation shop drawings, including major building structural components, detailed

pipe layout, elevations, hydraulic reference points, hanger and support locations, seismic brace locations, and components and accessories. Show all changes in ceiling elevation, obstructions, and hydraulically most remote area, with summary of calculation. Coordinate these shop drawings with all building elements, including, but not limited to, mechanical system, electrical systems, structural systems, architectural components, reflected ceilings, etc. Provide dimensioning of critical areas.

- E. Provide layout of sprinklers for the Building to have full sprinkler coverage.
- F. Plans shall be 1/4" equals 1'-0" scale minimum.
- G. After successful review by Architect and Engineer, submit shop drawings to Owner's insurance underwriter and local Fire Marshal for approval. Submit proof of approval to Architect/Engineer. Any deviation from approved plans must have approval from the Fire Marshal and Architect/Engineer.

1.9 OPERATION AND MAINTENANCE DATA

- A. Submit manufacturer's operation and maintenance data under provisions of Section 220500.
- B. Include written maintenance data on components of system, servicing requirements, and Record Drawings.

1.10 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 220500.
- B. Record actual locations of sprinklers and deviations of piping from Drawings. Indicate drain and test locations.

1.11 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this Section with minimum five years experience.
- B. Design sprinkler system under direct supervision of a Professional Engineer experienced in design of this work and licensed in the State where the project is located.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.
- B. All equipment, valves, alarms, gages, etc., shall be covered and protected during the execution of the work. All equipment and piping shall be protected from freezing. Labeling to remain in place.

- C. All unloading, hauling, and handling of materials shall be the responsibility of the sprinkler subcontractor.
- D. The sprinkler subcontractor can obtain information on available storage space on site from the Owner when making examination of the site.

1.13 EXTRA MATERIALS

- A. Provide extra sprinkler heads under provisions of NFPA 13.
- B. Provide suitable wrenches for each head type.
- C. Provide metal sprinkler storage cabinet with sprinklers in fire service room.

PART 2 - PRODUCTS

2.1 ALARM VALVES

- A. Acceptable Manufacturers:
 - 1. Viking Corporation.
 - 2. Central Sprinkler Company.
 - 3. Star Sprinkler Corporation.
- B. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate electrically and/or hydraulically operated alarms, with pressure retard chamber and variable pressure trim. Alarm check valve is based on Viking Model J-1.
- C. Alarm check valves shall allow discharge of one or more sprinkler heads to activate mechanical alarm and electric alarm signal.
- D. Provide retard chamber to allow for pressure fluctuations. Provide all other trim for variable pressure application.
- E. Provide water motor alarm, complete with all trim & electric bell.

2.2 SPRINKLERS

- A. Acceptable manufacturers:
 - 1. Viking Corporation.
 - 2. Central Sprinkler Company.
 - 3. Star Sprinkler Corporation.

Sprinklers are listed as a general guide; see drawings for specific sprinkler types.

- B. Finished Ceiling Type: Glass bulb automatic sprinkler, adjustable, recessed pendent type with

chrome-plated sprinkler and escutcheon, 1/2" orifice size, 5.6 K factor, 3/4" to 1-3/8" adjustable range below ceiling.

- C. Concealed Ceiling Type: Adjustable concealed automatic sprinkler with ceiling cover plate, 1/2" orifice size, 5.6 K factor, brass finish sprinkler, white factory painted cover plate.
- D. Upright Type: Glass bulb automatic upright sprinkler with chrome plate finish, 1/2" orifice size, 5.6 K factor.
- E. Sidewall Type: Sidewall glass bulb automatic sprinkler, chrome plated, 1/2" orifice size, 5.3 K factor. Provide chrome-plated escutcheon. Provide adjustable chrome-plated escutcheon where obstructions prevent the sprinkler from being directly mounted on wall.
- F. Pendant Type: Glass bulb automatic pendant sprinkler with chrome plate finish, 1/2" orifice size, 5.6 K factor. Provide adjustable chrome plated escutcheon and chrome plated sprinkler guard.
- G. Quick Response, Pendent and Upright Type: Quick response sprinkler, 1/2" orifice, 5.6 k factor; sprinkler and escutcheon shall be chrome plated.
- H. Extended Coverage Fast Response Sidewall Type: Extended coverage (16'x18') horizontal sidewall automatic sprinkler, 1/2" orifice, 5.6 K factor. Sprinkler and escutcheon shall be chrome plated.
- I. Dry Sidewall or Pendant Sprinkler: Glass bulb automatic sprinkler, chrome plated, 1/2" orifice size, 5.6 K factor, adjustable standard. Coordinate lengths with installation.
- J. Spare Sprinklers: Furnish spare automatic sprinklers in accordance with the requirements of NFPA Standard 13 for stock of extra sprinklers. The sprinklers shall be packed in a suitable container and shall be representative of, and in proportion to, the number of each type and temperature rating of the sprinklers installed. Furnish no less than two special sprinkler head wrenches, or at least one head wrench for each container or sprinkler box, whichever is greater.
- K. Guards: Finish to match sprinkler head.

2.3 FIRE DEPARTMENT CONNECTION

- A. Acceptable Manufacturers:
 - 1. Potter-Roemer, Inc.
 - 2. Central Sprinkler Company.
 - 3. Grinnell Fire Protection Equipment.
- B. Two-Way Fire Department connection is based on Potter-Roemer, Inc. Model 5710-B.
- C. Single Fire Department connections is based on a 5" Storz, with 30 degree angle fitting turned down. Verify requirements with Local Fire Department.
- D. Fire Department connections shall be constructed of cast brass with brass clapper, brass swivel

couplings and a brass hinge pin. The words "AUTO SPKR" and "F.D. Conn." are cast in raised letters on the body.

- E. Threads shall match local fire department's standard.

2.4 SPECIALTIES

- A. Acceptable Manufacturers:

1. Potter-Roemer, Inc
2. Central Sprinkler Co.
3. Star Sprinkler Corporation.

- B. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy red enameled gong and motor housing, nylon bearings and inlet strainer.

- C. Electric Bell Alarm: Electric operated motor type alarm with round red enamel steel bell with 120 Volt A.C. connection.

- D. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two sets (Form C) contacts rated 10 amp at 125/250 volt AC.

- E. Pressure Switch: 1/2 inch male pressure connection to alarm check valve wet system and actuated by any flow of water in excess of one sprinkler. Maximum pressure rating, 175 psi, weatherproof, with tamper resistant screws, rated 10 amp at 125/250 volt AC.

- F. Valve Supervisory Switch: Shall be installed on all control valves, 120 volt AC output. Switch based on Potter-Roemer, Fig. #6220 through 6223.

- G. Retard Chamber: Shall be of the same manufacturer as alarm valve.

- H. Pressure Gauge: Stainless steel 3-1/2 inch case with 1/4 inch male N.P.T. connection, glass enclosed dial with range of 0-300 psi.

2.5 REDUCED PRESSURE DETECTOR ASSEMBLY

- A. Reduced Pressure Detector Assembly: ANSI/ASSE 1013 (AWWA C506); bronze body, two independently operating, spring loaded check valves. Diaphragm type differential pressure relief valve located between check valves; assembled with two gate valves, strainer, test cocks and metered bypass. Detector assembly shall be Model #909RPDA as manufactured by Watts. Equivalent products may be submitted for consideration.

- B. Detector assembly shall be the line size as the pipe it is connected to. Each assembly shall conform to the characteristics required by the utility providing fire water service. Verify fire service utility requirements.

- C. Detector assembly shall prevent the reverse flow of fire protection system substances from being pumped or syphoned into safe drinking water system. Assemblies shall be able to detect

leaks. Provide relief vent to atmosphere.

- D. Detector assembly shall feature resilient wedge shut-offs, epoxy coated cast iron body construction, removable bronze seats, stainless steel internal parts, and shall be tested and certified under FCCCHR of USC Manual Section 10.

2.6 INDICATOR VALVE AND POST

- A. UL listed/FM approved resilient seat gate valve with non-rising stems(NRS) and indicator post flange. Gate valves shall be iron body, bronze mounted, double disc, and parallel seat type. All NRS gate valves to be "O" ring packed and have a handwheel. Valves shall have an epoxy coated interior, replaceable rubber seat, bronze stem and traveling nut. 200 psi working pressure, 400 psi test pressure.
- B. UL listed/FM approved listed adjustable indicator posts have a 18" adjustment span. Stems as furnished are for use with the longest adjustments and the stem may be field cut for shorter settings. Low silhouette indicator post upper barrel shall protect all working parts from weather. The indicator post windows shall be made of non-breakable plastic to insure long service life and have lubrication points so that bearing surfaces can be oiled. Provide a padlock as approved by the Fire Marshal.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate work of this Section with other affected work.
- B. The subcontractor shall perform a flow test to confirm design data obtained with the Local Water Company as follows: ## psi static; ## psi residual at ### GPM. Existing flow data to not exceed one year to date.
- C. Subcontractor shall field verify prior to the installation of the sprinkler system the location of exposed structure and other building elements. Furnish and install the appropriate sprinkler head type and spacing per NFPA for this application.

3.2 INSTALLATION - FIRE SERVICE

- A. Installation of new 6 inch fire service shall be done in accordance with Water Utility and NFPA-24.
- B. Concrete thrust blocks are to be provided at each change in direction of the new fire service and at all tees and bends. The concrete shall be of a mix of one part cement, two and one-half parts sand, and five parts stone. Backing to be placed between undisturbed earth and fitting being restrained. Backing shall be of such bearing area as to assure adequate resistance and shall be placed so joints are accessible for inspection and repair.

- C. Tie-rods to be provided on new fire service at point where service enters building foundation. Minimum threaded rod size shall be 5/8 inch.
- D. Pipe shall have a minimum of 5'-0" of cover.
- E. Provide a flanged fitting within building at 6 inches above finished floor.
- F. Bolted joints shall be cleaned and coated with asphalt or other corrosion retarding material.
- G. Foundation penetration shall be sealed water tight.
- H. Upon completion of fire service installation, piping shall be flushed and tested before backfilling in accordance with NFPA-24.
- I. Refer to Specification Section - Trench Excavation for trenching and backfilling.

3.3 INSTALLATION - PIPING

- A. Install equipment in accordance with manufacturers instructions.
- B. Products shall be installed in accordance with the requirements of this Specification and all applicable NFPA Standards.
- C. Impairments to the existing water supplies shall be minimized. All work shall be complete before making the final connections to the existing water supplies. Notify the Owner's representative before impairing any fire protection equipment.
- D. Maintain a clean and orderly site during the installation of the sprinkler system. Materials shall not be stored in the halls or other public areas.
- E. Cutting, welding and other hot work shall not be permitted without permission from the building owner.
- F. Provide approved backflow assembly at sprinkler system water source connection.
- G. Locate Fire Department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.
- H. Locate outside alarm gong on building wall as indicated.
- I. Place pipe runs to minimize obstruction to other work.
- J. Provide OS&Y gate valves directly in front of and immediately after detector assembly. There shall be no fittings or pipe between gate valves and detector assembly.
- K. Provide piping offsets as required to center heads in two directions in ceiling tile.
- L. Apply strippable tape or paper cover to ensure concealed sprinkler head cover plates do not

receive field paint finish.

- M. All sprinkler piping shall be installed concealed above ceilings and within walls unless noted otherwise on the drawings.
- N. Hydrostatically test entire system.
- O. Require test to be witnessed by the Fire Marshal.
- P. Keep sprinkler system downtime to a minimum.
- Q. Provide access panels for all valves and flow switches.

3.4 INSTALLATION - SPRINKLERS

- A. Provide sprinkler coverage throughout the entire Building.
- B. Provide sprinkler layout of entire building for review by Architect/Engineer

3.5 EXTRA STOCK

- A. Provide extra sprinkler heads under provisions of NFPA 13. Provide extra sprinkler heads in proportion to the type of heads installed.
- B. Provide suitable wrenches for each head type.
- C. Provide sprinkler head cabinets to store the extra supply of heads and wrenches in locations designated.

3.6 CLEANING

- A. Flush entire piping system of foreign matter.

3.7 IDENTIFICATION

- A. Provide and apply signs to control, drain, test and alarm valves to identify their purpose and function. Provide and permanently attach hydraulic calculations data nameplate at the controlling valve for the sprinkler system. Provide lettering size and style from NFPA's suggested styles.

3.8 TESTING

- A. Piping; The completed system shall be subject to a pressure test, and to such other tests as the authorities having jurisdiction may require. The pressure test shall be a hydrostatic pressure of (200) pounds per square inch for a period of two hours. The above ground piping and attached appurtenances shall show no pressure loss or leaks, refer to NFPA Standard 13 Hydrostatic Tests. For buried piping, refer to NFPA Standard 24 Testing Underground Systems. Before applying specific test pressure, all air must be expelled from the system. All defects of whatever type

shall be repaired or replaced to the satisfaction of the Owner and authorities having jurisdiction. Packing rings, special joint bolts, gaskets, and other material required for the proper installation of the pipe and fittings shall be provided. Testing shall be completed prior to permanent sealing of walls and partition.

- B. Leaks in mechanical joints shall be repaired by dismantling the joint, reassembling it, and tightening the bolts in the correct order. Leaks in screw or grooved joint shall be repaired by dismantling the joint and reassembling it. Attempting to repair leaks in joints by over tightening the bolts or fittings shall not be permitted.
- C. Upon satisfactory completion of all tests, submit three copies of the Standard Contractors Material and Test Certificate to the Owner.

END OF SECTION 211300

SECTION 220500 – COMMON WORK RESULTS FOR PLUMBING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Identification for Plumbing Piping and Equipment.
 - 2. Sleeves.
 - 3. Mechanical sleeve seals.
 - 4. Formed steel channel.

1.3 SUBMITTALS

- A. Shop Drawings: Submit for piping and equipment identification list of wording, symbols, letter size, and color coding for pipe identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- B. Product Data for Pipe and Equipment Identification: Submit for mechanical identification manufacturers catalog literature for each product required.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with State of Connecticut standards.
- B. Maintain one copy of each document on site.

PART 2 - PRODUCTS

2.1 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

- A. Furnish materials in accordance with State of Connecticut standards.
- B. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light background color.
- C. Plastic Tags: Laminated three-layer plastic with engraved black letters on light background color, minimum 1-1/2 inches diameter.

- D. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener. Color and Lettering: Conform to ASME A13.1.
- E. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Color and Lettering: Conform to ASME A13.1.
- F. Plastic Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.2 SLEEVES

- A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage thick galvanized steel.
- B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.
- C. Sealant: Acrylic.

2.3 MECHANICAL SLEEVE SEALS

- A. Manufacturers:
 - 1. Thunderline Link-Seal, Inc.
 - 2. Substitutions: Permitted
- B. Furnish materials in accordance with State of Connecticut standards.
- C. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.4 FORMED STEEL CHANNEL

- A. Manufacturers:
 - 1. Allied Tube & Conduit Corp.
 - 2. B-Line Systems.
 - 3. Unistrut Corp.
 - 4. Substitutions: Permitted.
- B. Furnish materials in accordance with State of Connecticut standards.
- C. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify openings are ready to receive sleeves.

3.2 INSTALLATION - PIPING AND EQUIPMENT IDENTIFICATION

- A. Install plastic nameplates with adhesive.
- B. Install plastic tags with corrosion resistant metal chain.

3.3 INSTALLATION - SLEEVES

- A. Exterior watertight entries: Seal with mechanical sleeve seals.
- B. Set sleeves in position in forms. Provide reinforcing around sleeves.
- C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- D. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.
- E. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with firestopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- F. Install stainless steel escutcheons at finished surfaces.

3.4 DISINFECTION SEQUENCE - POTABLE WATER SYSTEMS

- A. The pipe system shall be flushed with clean, potable water until dirty water does not appear at the points of outlet.
- B. The system or part thereof shall be filled with a water/chlorine solution containing at least 50 parts per million of chlorine, and the system or part thereof shall be valved off and allowed to stand for 24 hours; or the system or part thereof shall be filled with a water/chlorine solution containing at least 200 parts per million of chlorine and allowed to stand for 3 hours.
- C. Following the allowed standing time, the system shall be flushed with clean potable water until chlorine does not remain in the water coming from the system.
- D. The procedure shall be repeated if it is shown by a bacteriological examination by the authority that contamination is still present in the system.

END OF SECTION 220500

SECTION 220700 – PLUMBING INSULATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Plumbing piping insulation, jackets and accessories.
 - 2. Plumbing equipment insulation, jackets and accessories.

1.3 SUBMITTALS

- A. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.
- B. Samples: Submit one samples of representative size illustrating each insulation type.
- C. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84
- B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.
- C. Factory fabricated fitting covers manufactured in accordance with ASTM C450.
- D. Perform Work in accordance with State of Connecticut standards.
- E. Maintain one copy of document on site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.
- B. Maintain temperature before, during, and after installation for minimum period of 24 hours.

1.7 WARRANTY

- A. Furnish five year manufacturer warranty for man made fiber.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Manufacturers for Glass Fiber and Mineral Fiber Insulation Products:
 - 1. CertainTeed.
 - 2. Knauf.
 - 3. Johns Manville.
 - 4. Owens-Corning.
 - 5. Substitutions: Permitted.
- B. Manufacturers for Closed Cell Elastomeric Insulation Products:
 - 1. Aeroflex. Aerocell.
 - 2. Armacell, LLC. Armaflex.
 - 3. Nomaco. K-flex.
 - 4. Substitutions: Permitted.
- C. Manufacturers for Polyisocyanurate Foam Insulation Products:
 - 1. Dow Chemical Company.
 - 2. Substitutions: Permitted.
- D. Manufacturers for Extruded Polystyrene Insulation Products:
 - 1. Dow Chemical Company.
 - 2. Substitutions: Permitted.
- E. Furnish materials in accordance with State of Connecticut standards.

2.2 PIPE INSULATION

- A. TYPE P-1: ASTM C547, molded glass fiber pipe insulation. Conform to ASTM C795 for application on Austenitic stainless steel.
 - 1. Thermal Conductivity: 0.23 at 75 degrees F.
 - 2. Operating Temperature Range: 0 to 850 degrees F.
 - 3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied reinforced foil kraft with self-sealing adhesive joints.
 - 4. Jacket Temperature Limit: minus 20 to 150 degrees F.

- B. TYPE P-2: ASTM C547, molded glass fiber pipe insulation. Conform to ASTM C795 for application on Austenitic stainless steel.
 - 1. Thermal Conductivity: 0.23 at 75 degrees F.
 - 2. Operating Temperature Range: 0 to 850 degrees F.
- C. TYPE P-3: ASTM C612; semi-rigid, fibrous glass board noncombustible, end grain adhered to jacket. Conform to ASTM C795 for application on Austenitic stainless steel.
 - 1. Thermal Conductivity: 0.27 at 75 degrees F.
 - 2. Operating Temperature Range: 0 to 650 degrees F.
 - 3. Vapor Barrier Jacket: ASTM C1136, Type II, factory applied reinforced foil kraft with self-sealing adhesive joints.
 - 4. Jacket Temperature Limit: minus 20 to 150 degrees F.
- D. TYPE P-4: ASTM C612; semi-rigid, fibrous glass board noncombustible. Conform to ASTM C795 for application on Austenitic stainless steel.
 - 1. Thermal Conductivity: 0.27 at 75 degrees F.
 - 2. Operating Temperature Range: 0 to 650 degrees F.
- E. TYPE P-5: ASTM C534, Type I, flexible, closed cell elastomeric insulation, tubular.
 - 1. Thermal Conductivity: 0.27 at 75 degrees F.
 - 2. Operating Temperature Range: Range: Minus 70 to 180 degrees F.
- F. TYPE P-6: ASTM C534, Type I, flexible, closed cell elastomeric insulation, tubular.
 - 1. Thermal Conductivity: 0.30 at 75 degrees F.
 - 2. Maximum Service Temperature: 300 degrees F.
 - 3. Operating Temperature Range: Range: Minus 58 to 300 degrees F.
- G. TYPE P-7: ASTM C534, Type I, flexible, nonhalogen, closed cell elastomeric insulation, tubular.
 - 1. Thermal Conductivity: 0.27 at 75 degrees F.
 - 2. Maximum Service Temperature: 250 degrees F.
 - 3. Operating Temperature Range: Range: Minus 58 to 250 degrees F.
- H. TYPE P-8: ASTM C547, Type I or II, mineral fiber preformed pipe insulation, noncombustible.
 - 1. Thermal Conductivity: 0.23 at 75 degrees F.
 - 2. Maximum Service Temperature: 1200 degrees F.
 - 3. Canvas Jacket: UL listed, 6 oz/sq yd, plain weave cotton fabric treated with fire retardant lagging adhesive.
- I. TYPE P-9: ASTM C591, Type IV, polyisocyanurate foam insulation, formed into shapes for use as pipe insulation.
 - 1. Density: 2.0 pounds per cubic foot.
 - 2. Thermal Conductivity: 180 day aged value of 0.19 at 75 degrees F.
 - 3. Operating Temperature Range: Range: Minus 297 to 300 degrees F.
 - 4. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied film of 4 mils thickness and water vapor permeance of 0.02 perms.
- J. TYPE P-10: ASTM C578, Type XIII, extruded polystyrene insulation, formed into shapes for use as pipe insulation.

1. Thermal Conductivity: 180 day aged value of 0.259 at 75 degrees F.
2. Operating Temperature Range: Range: Minus 297 to 165 degrees F.
3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied film of 4]mils thickness and water vapor permeance of 0.02 perms.

K. TYPE P-11: ASTM C533; Type I, hydrous calcium silicate pipe insulation, rigid molded white; asbestos free.

1. Thermal Conductivity: 0.45 at 200 degrees F.
2. Operating Temperature Range: 140 to 1200 degrees F.

2.3 PIPE INSULATION JACKETS

A. Vapor Retarder Jacket:

1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.
2. Water vapor transmission: ASTM E96/E96M; 0.02 perm-inches.

B. PVC Plastic Pipe Jacket:

1. Product Description: ASTM D1785, One piece molded type fitting covers and sheet material, off-white color.
2. Thickness: 10 mil.
3. Connections: Brush on welding adhesive.

2.4 PIPE INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive: Compatible with insulation.

B. Covering Adhesive Mastic: Compatible with insulation.

C. Piping 1-1/2 inches diameter and smaller: Galvanized steel insulation protection shield. MSS SP-69, Type 40. Length: Based on pipe size and insulation thickness.

D. Piping 2 inches diameter and larger: Wood insulation saddle, hard maple. Inserts length: not less than 6 inches long, matching thickness and contour of adjoining insulation.

E. Closed Cell Elastomeric Insulation Pipe Hanger: Polyurethane insert with aluminum single piece construction with self adhesive closure. Thickness to match pipe insulation.

F. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

G. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449/C449M.

H. Insulating Cement: ASTM C195; hydraulic setting on mineral wool.

I. Adhesives: Compatible with insulation.

2.5 EQUIPMENT INSULATION

A. TYPE E-1: ASTM C553; glass fiber, flexible or semi-rigid, noncombustible.

1. Thermal Conductivity: 0.24 at 75 degrees F.
2. Operating Temperature Range: 0 to 450 degrees F.

3. Density: 1.5 pound per cubic foot.
- B. TYPE E-2: ASTM C612; glass fiber, rigid board, noncombustible with factory applied kraft aluminum foil jacket.
 1. Thermal Conductivity: 0.24 at 75 degrees F.
 2. Operating Temperature Range: 0 to 450 degrees F.
 3. Density: 3.0 pound per cubic foot.
 4. Jacket Temperature Limit: minus 20 to 150 degrees F.
 - C. TYPE E-3: ASTM C612; semi-rigid, fibrous glass board noncombustible, end grain adhered to jacket.
 1. Thermal Conductivity: 0.27 at 75 degrees F.
 2. Operating Temperature Range: 0 to 650 degrees F.
 3. Vapor Barrier Jacket: ASTM C1136, Type II, factory applied reinforced foil kraft with self-sealing adhesive joints.
 4. Jacket Temperature Limit: minus 20 to 150 degrees F.
 - D. TYPE E-4: ASTM C612; semi-rigid, fibrous glass board noncombustible.
 1. Thermal Conductivity: 0.27 at 75 degrees F.
 2. Operating Temperature Range: 0 to 650 degrees F.
 - E. TYPE E-5: ASTM C612; glass fiber, semi-rigid board, noncombustible.
 1. Thermal Conductivity: 0.23 at 75 degrees F.
 2. Maximum Operating Temperature: 850 degrees F.
 3. Density: 3.0 pound per cubic foot.
 - F. TYPE E-6: ASTM C553; mineral fiber blanket, Type I.
 1. Thermal Conductivity: 0.27 at 75 degrees F.
 2. Maximum Operating Temperature: 1000 degrees F.
 3. Density: 1.0 pound per cubic foot.
 - G. TYPE E-7: ASTM C533; Type II, hydrous calcium silicate block insulation, asbestos free.
 1. Thermal Conductivity: 0.45 at 200 degrees F.
 2. Operating Temperature Range: 140 to 1200 degrees F.
 - H. TYPE E-8: ASTM C534, Type II, flexible, closed cell elastomeric insulation, sheet.
 1. Thermal Conductivity: 0.27 at 75 degrees F.
 2. Operating Temperature Range: Range: Minus 70 to 220 degrees F.
 - I. TYPE E-9: ASTM C612, man made mineral fiber, noncombustible, Classes 1-4.
 1. Thermal Conductivity: 0.25 at 100 degrees F.
 2. Maximum Service Temperature: 1200 degrees F.
 3. Density: 4 pound per cubic foot.

2.6 EQUIPMENT INSULATION JACKETS

- A. PVC Plastic Equipment Jacket:
 1. Product Description: ASTM D1785, sheet material, off-white color.
 2. Minimum Service Temperature: -40 degrees F.

3. Maximum Service Temperature: 150 degrees F.
 4. Water Vapor Transmission: ASTM E96/E96M; 0.002 perm-inches.
 5. Thickness: 10 mil.
 6. Connections: Brush on welding adhesive.
- B. Aluminum Equipment Jacket:
1. ASTM B209.
 2. Thickness: 0.016 inch thick sheet.
 3. Finish: Smooth.
 4. Joining: Longitudinal slip joints and 2 inch laps.
 5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
 6. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
- C. Stainless Steel Equipment Jacket:
1. ASTM ASTM A240/A240M OR ASTM 666 Type 302 stainless steel.
 2. Thickness: 0.010 inch thick.
 3. Finish: Smooth.
 4. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.
- D. Canvas Equipment Jacket: UL listed, 6 oz/sq yd, plain weave cotton fabric with fire retardant lagging adhesive compatible with insulation.
- E. Vapor Retarder Jacket:
1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.
 2. Water vapor transmission: ASTM E96/E96M; 0.02 perm-inches.
- F. Field Applied Glass Fiber Fabric Jacket System:
1. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
 2. Glass Fiber Fabric:
 - a. Cloth: Untreated; 9 oz/sq yd weight.
 - b. Blanket: 1.0 lb/cu ft density.
 - c. Weave: 5 x 5.
 3. Indoor Vapor Retarder Finish:
 - a. Cloth: Untreated; 9 oz/sq yd weight.
 - b. Vinyl emulsion type acrylic, compatible with insulation, black color.

2.7 EQUIPMENT INSULATION ACCESSORIES

- A. Vapor Retarder Lap Adhesive: Compatible with insulation.
- B. Covering Adhesive Mastic: Compatible with insulation.
- C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- D. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449/C449M.
- E. Adhesives: Compatible with insulation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify piping and equipment has been tested before applying insulation materials.
- B. Verify surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION - PIPING SYSTEMS

- A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.
- B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to Section 07 84 00 for penetrations of assemblies with fire resistance rating greater than one hour.
- C. Piping Systems Conveying Fluids Below Ambient Temperature:
 - 1. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
 - 2. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
 - 3. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.
- D. Glass Fiber Board Insulation:
 - 1. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
 - 2. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
 - 3. Cover wire mesh or bands with cement to a thickness to remove surface irregularities.
- E. Polyisocyanurate Foam Insulation:
 - 1. Wrap elbows and fitting with vapor retarder tape.
 - 2. Seal butt joints with vapor retarder tape.
- F. Hot Piping Systems less than 140 degrees F:
 - 1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
 - 3. Do not insulate unions and flanges at equipment, but bevel and seal ends of insulation at such locations.
- G. Hot Piping Systems greater than 140 degrees F:

1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
3. Insulate flanges and unions at equipment.

H. Inserts and Shields:

1. Piping 1-1/2 inches Diameter and Smaller: Install galvanized steel shield between pipe hanger and insulation.
2. Piping 2 inches Diameter and Larger: Install insert between support shield and piping and under finish jacket.
 - a. Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.
 - b. Insert Material: Compression resistant insulating material suitable for planned temperature range and service.
3. Piping Supported by Roller Type Pipe Hangers: Install galvanized steel shield between roller and inserts.

I. Insulation Terminating Points:

1. Coil Branch Piping 1 inch and Smaller: Terminate hot water piping at union upstream of the coil control valve.
2. Chilled Water Coil Branch Piping: Insulate chilled water piping and associated components up to coil connection.
3. Condensate Piping: Insulate entire piping system and components to prevent condensation.

J. Closed Cell Elastomeric Insulation:

1. Push insulation on to piping.
2. Miter joints at elbows.
3. Seal seams and butt joints with manufacturer's recommended adhesive.
4. When application requires multiple layers, apply with joints staggered.
5. Insulate fittings and valves with insulation of like material and thickness as adjacent pipe.

K. Buried Piping: Insulate only where insulation manufacturer recommends insulation product may be installed in trench, tunnel or direct buried. Install factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with 1 mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with polyester film.

L. Heat Traced Piping Interior to Building: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer.

M. Heat Traced Piping Exterior to Building: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size insulation large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water.

N. Prepare pipe insulation for finish painting. Refer to Section 09 90 00.

3.3 INSTALLATION - EQUIPMENT

A. Factory Insulated Equipment: Do not insulate.

B. Exposed Equipment: Locate insulation and cover seams in least visible locations.

C. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.

D. Equipment Containing Fluids Below Ambient Temperature:

1. Insulate entire equipment surfaces.
2. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
3. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
4. Finish insulation at supports, protrusions, and interruptions.

E. Equipment Containing Fluids 140 degrees F Or Less:

1. Do not insulate flanges and unions, but bevel and seal ends of insulation.
2. Install insulation with factory-applied or field applied jackets, with or without vapor barrier. Finish with glass cloth and adhesive.
3. Finish insulation at supports, protrusions, and interruptions.

F. Equipment Containing Fluids Over 140 degrees F:

1. Insulate flanges and unions with removable sections and jackets.
2. Install insulation with factory-applied or field applied jackets, with or without vapor barrier. Finish with glass cloth and adhesive.
3. Finish insulation at supports, protrusions, and interruptions.

G. Nameplates and ASME Stamps: Bevel and seal insulation around; do not cover with insulation.

H. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.

I. Prepare equipment insulation for finish painting. Refer to Section 09 90 00.

3.4 SCHEDULES

A. Water Supply Services Piping Insulation Schedule:

SEE NEXT PAGE

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS inches
Domestic Hot Water Supply and Recirculation	P-1	1-1/4 inches and smaller	1.0
		1-1/2 inches and larger	1.0
Domestic Cold Water	P-2	1-1/4 inches and smaller	1.0
		1-1/2 inches and larger	1.0
Deionized Water	P-3	All sizes	1.0

B. Drainage Services Piping Insulation Schedule:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS inches
Storm Piping (horizontal above ground within building)	P-4	All sizes	1.0
Storm Piping (horizontal and vertical above ground below building when PVC pipe is used)	P-5	All sizes	1.5
Sanitary Sewer Piping (horizontal and vertical above ground below building when PVC piping is used)	P-6	All sizes	1.5

C. Equipment Insulation Schedule:

EQUIPMENT	INSULATION TYPE	INSULATION THICKNESS inches
Roof Drain Bodies	E-2	0.5
Domestic Hot Water Storage Tanks	E-1	1.5

END OF SECTION 220700

SECTION 221000 – PLUMBING PIPING AND PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipe hangers and supports.
 - 2. Plumbing piping.
 - 3. Valves.
 - 4. Piping specialties.
 - 5. Plumbing drainage specialties.
 - 6. Plumbing supply specialties.
 - 7. Sump pumps.

1.3 SUBMITTALS

- A. Product Data: Required.
- B. Manufacturer's Installation Instructions: Required.
- C. Manufacturer's Certificate: Required.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Required.

1.5 WARRANTY

- A. Furnish five year manufacturer warranty for pumps.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

- A. Conform to ASME B31.9.

2.2 PIPES AND TUBES

- A. Sanitary Sewer Piping, Buried Within 5 Feet of Building and Sanitary Sewer Piping, above Grade:
 - 1. Cast Iron Pipe: ASTM A74, service weight, with neoprene gaskets or lead and oakum joints.
 - 2. Cast Iron Pipe: CISPI 301, hubless, service weight, with neoprene gaskets and stainless steel clamps.

3. Copper Tube: ASTM B306, type DWV with cast bronze or wrought copper fittings and Grade 50B solder joints.
 4. ABS Pipe: ASTM D2661 or ASTM D2751 with ABS fittings and solvent weld joints.
 5. PVC Pipe: ASTM D2665 or ASTM D3034 SDR 26, polyvinyl chloride (PVC) material.
 - a. Fittings: PVC, ASTM D2665 or ASTM D3034.
 - b. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.
 6. PVC Pipe: ASTM D2665, ASTM D3034, or ASTM F679 with PVC fittings and elastomeric gasket joints.
- B. Water Piping, Buried Within 5 Feet of Building:
1. Copper Tubing: ASTM B42, Tempered O61 annealed without fittings.
 2. Ductile Iron Pipe: AWWA C151 with ductile iron fittings rubber gasket joints and 3/4 inch diameter rods.
- C. Water Piping, above Grade:
1. Copper Tubing: ASTM B88, Type L, drawn, with cast brass or wrought copper fittings and Grade 95TA solder joints.
 2. Galvanized Steel Pipe (Cold Water Only Sizes 4 inch and Larger): ASTM A53/A53M, Grade B, Schedule 40 with cast iron fittings and grooved mechanical couplings.
- D. Equipment Drains and Overflows:
1. Steel Pipe: ASTM A53/A53M, Grade B, Schedule 40 black steel, malleable iron or forged steel fittings, threaded or welded joints.
 2. Copper Tubing: ASTM B88, Type L, drawn, cast brass, wrought copper fittings, lead free solder joints.
 3. PVC Pipe: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26, PVC fittings, solvent weld joints. Plenum rated.

2.3 VALVES

- A. For drinking water service, provide valves complying with NSF 61.
- B. Gate Valves:
1. Up to 2 inches: Bronze body, bronze trim, non-rising stem, soldered or threaded ends.
 2. Over 2 inches: Iron body, bronze trim, rising stem, hand wheel, OS&Y, flanged or grooved ends.
- C. Ball Valves:
1. Up to 2 inches: Bronze one piece body, lever handle, solder or threaded ends.
 2. Over 2 inches: Cast steel flanged body, lever handle.
- D. Plug Valves:
1. Up to 2 inches: Bronze body, bronze tapered plug, non-lubricated, threaded ends.
 2. Over 2 inches: Cast iron body and plug, pressure lubricated, flanged ends.
- E. Butterfly Valves:
1. Up To 2 inches: Bronze body, stainless steel disc, threaded ends, 10-position lever handle.
 2. Over 2 inches: Iron body, chrome plated iron disc, wafer or lug ends, 10 position lever handle.

- F. Swing Check Valves:
 - 1. Up to 2 inches: Bronze body and swing disc, solder or threaded ends.
 - 2. Over 2 inches: Iron body, bronze trim, flanged ends.
- G. Spring Loaded Check Valves:
 - 1. Iron body, bronze trim with threaded, wafer or flanged ends.
- H. Relief Valves:
 - 1. Bronze body, automatic, direct pressure actuated, ASME labeled.

2.4 PIPING SPECIALTIES

- A. Strainers:
 - 1. Size 2 inches and Under: Threaded ends, brass or iron body, Y pattern.
 - 2. Size 2-1/2 inch to 4 inch: Flanged iron body, Y pattern.
 - 3. Size 5 inch and Larger: Flanged iron body, basket pattern.
- B. Flexible Connectors:
 - 1. Corrugated stainless steel hose with stainless steel exterior braiding.
- C. Pressure Gages:
 - 1. Gage: ASME B40.1.
 - a. Case: Cast aluminum.
 - b. Dial Size: 3-1/2 inch diameter.
 - c. Mid-Scale Accuracy: One percent.
- D. Thermometers:
 - 1. Stem Type Thermometer: ASTM E1.
 - a. Size: 9 inch scale.
 - b. Accuracy: ASTM E77 2 percent.
- E. Heat Trace:
 - 1. Self-Regulating Heating Cable.
 - a. Electric Based System.
 - b. Load: 8 Watts / foot.
 - c. Volts: 208V.
 - d. Jacket Type: Polyolefin.

2.5 PLUMBING DRAINAGE SPECIALTIES

- A. Floor Drains:
 - 1. Floor Drain (FD): Lacquered cast iron body with removable perforated sediment bucket and adjustable round strainer.
 - 2. All floor drains to be provided with Trap seal rubber plugs.
- B. Cleanouts:
 - 1. Finished Floor: Cast iron body with adjustable nickel-bronze round scored cover in service areas and round depressed cover to accept floor finish in finished floor areas.
 - 2. Line Type: Cast iron body, round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

2.6 PLUMBING SUPPLY SPECIALTIES

- A. Backflow Preventers:
 - 1. Reduced Pressure Backflow Preventers: ASSE 1013; assembled with two gate valves, strainer, and four test cocks.
- B. Water Hammer Arrestors:
 - 1. Copper construction, piston type constructed to PDI WH 201.
- C. Thermostatic Mixing Valves:
 - 1. Capacity 77 gpm at 45 psi differential, with check valve, volume control shut-off valve on outlet, stem type thermometer on outlet, strainer stop check on inlet.
 - 2. Conform to ASSE 1070 to temper water to maximum 110 degrees F.
- D. Hose Bibbs/Hydrants:
 - 1. Interior Hose Bibs: Bronze or brass, replaceable hexagonal disc, hose thread spout, chrome plated with vacuum breaker.
 - 2. Wall Hydrant: Non-freeze, self-draining type with chrome plated, lockable recessed box hose thread spout, removable key, and vacuum breaker.
- E. Diaphragm-type Compression Tanks:
 - 1. Construction: Welded steel, ASME tested and stamped; with flexible diaphragm sealed into tank, and steel legs or saddles.

PART 3 - EXECUTION

3.1 INSTALLATION - VALVES

- A. Install gate, ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- B. Install ball valves for throttling, bypass, or manual flow control services.
- C. Provide lug end butterfly valves adjacent to equipment when functioning to isolate equipment.
- D. Install spring loaded check valves on discharge of pumps.
- E. Install valves for throttling service. Install non-lubricated plug valves only when shut-off or isolating valves are also installed.

3.2 INSTALLATION - PLUMBING SUPPLY PIPING

- A. Install water piping in accordance with ASME B31.9.
- B. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to washing machine outlets & flush valve toilets.
- C. Provide water service complete with approved back-flow preventer and water meter with by-pass valves and sand strainer as required.
- D. Test backflow preventers in accordance with ASSE.

- E. Disinfect domestic water system piping in accordance with local code requirements.
- F. Test domestic water system piping per 2003 IPC and in accordance with local code requirements.

3.3 INSTALLATION - PLUMBING DRAINAGE PIPING

- A. Excavate and backfill in accordance with Section 31 20 00.
- B. Establish elevations of buried piping outside building to provide not less than 1 ft of cover.
- C. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.
- D. Test drainage piping per 2003 IPC and in accordance with local code requirements.

3.4 INSTALLATION - PIPE HANGERS AND SUPPORTS

- A. Install in accordance with ASME B31.9.
- B. Support horizontal piping using spacing in accordance with local code requirements.

3.5 SERVICE CONNECTIONS

- A. Install sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and verify proper slope for drainage and proper cover to avoid freezing.
- B. Install new water service complete with water meter with by-pass valves. Install sleeve in wall for service main and supported at wall, calked and made watertight.

3.6 SCHEDULES

PIPES AND TUBES			
	Buried	Above Grade	
A. Sanitary Sewer	A.5. PVC	A.5. PVC	
B. Water	B.1. Copper Tubing	C.1. Copper	
C. Storm	---	---	
D. Equipment Drains & Overflows		E.2. Copper	

END OF SECTION 221000

SECTION 230500 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The following Drawings indicate the work required under this Division.

All Drawings associated with this project.
And All Other Contract Drawings.

- B. Certain items of work pertaining to the work of this Division are provided under other Divisions of the Specification. These include, but are not limited to the following:

1. Excavating and backfilling for buried utilities, piping, etc.
2. Concrete work for equipment bases, thrust blocks, meter pads, valve boxes, etc.
3. Installation of access doors in finished construction.
4. Installation of pipe sleeves in walls and floors.
5. Wiring of mechanical equipment. (Motor starters furnished under this Section.)
6. Framing of openings in walls, floors, roof for ductwork, piping, fans, etc.
7. Chases, soffits, furred spaces required to conceal work of this Division.
8. Flashings for plumbing vents, roof curbs, etc.
9. Wiring of sprinkler system controls, accessory equipment.
10. Wiring for low voltage wiring is by this Division.

- C. Materials furnished under other Divisions and installed by this Division include, but are not limited to:

1. Refer to Architectural Specifications and Drawings to determine items furnished under other Sections that will require work under this Division and include such work.

- D. Complete Utility connections as indicated or needed, extension to Project, metering as required, and connection to building systems, including:

1. Apply for all services and pay for all fees, assessments, and charges of the Utility

for each connection, all in a timely manner and according to the Project Schedule.

2. Provide and install all metering, valves, accessories as required by Utility. Install entire service in accordance with the Utility's requirements or other applicable regulation.
 3. All necessary coordination with Utility to determine scope of work provided by Utility and the part provided by Contractor so that a complete Utility connection is made.
- E. Provide coordination for Mechanical and Electrical installations. Provide additional coordination drawings, as directed by Architect, in areas of potential interferences.
- F. All work shall comply with applicable codes and regulations, including, but not limited to the following:
1. Connecticut Building, Fire Safety, and Health Codes, as amended, including all codes, standards and regulations referenced therein.
 2. Requirements of Local, State, and Federal authorities having jurisdiction over the Work.
 3. Current regulations of the Occupational Safety and Health Administration (OSHA).
 4. Requirements of affected Public Utility Companies.
 5. Special requirements set down by the Owner, the Owner's Insurance Carrier, or other concerned entities.

1.2 RELATED DOCUMENTS

- A. Instructions to Bidders, the General Conditions of The Contract, and General Requirements shall apply and be binding to the Contractor and their subcontractors, vendors or suppliers who performs work under this Division.
- B. Where items of the General or Special Conditions are repeated in this Section, it is intended to call particular attention to or qualify them. It is not intended that any parts of the General or Special Conditions be assumed to be omitted if not repeated in this Section.

1.3 INTENT

- A. Intent of the Specifications and Drawings is to call for finished work, tested and ready for operation.
- B. Material and equipment mentioned in Specifications or shown on the Drawings shall be furnished new, completely installed and adjusted, and left in a clean, safe, and satisfactory condition ready for operation. All supplied appliances and connections of every sort ne-

cessary shall be furnished and installed to the satisfaction of the Architect and Owner.

- C. Apparatus, appliances, material, or work not shown on the Drawings but mentioned in Specifications, or vice versa, or any incidental accessory items such as valves, unions, fittings, etc., necessary to make the work complete, serviceable, and perfect in all respects and ready for operation, even though not particularly specified or shown, shall be provided and installed without additional cost to the Owner.
- D. Minor details not usually shown or specified, but necessary for the proper installation and operation of the work shall be included as if specified herein.
- E. Prior to submission of bids, give written notice to Architect of any materials or apparatus believed to be inadequate, unsuitable, or in violation of laws, ordinances, rules, or regulations of the authorities having jurisdiction over the work; or any necessary items believed omitted. In absence of such notice, it is mutually agreed that the cost of all required and necessary items has been included in the bid and that all systems specified and shown will function satisfactorily without claim for additional cost to the Owner.

1.4 DEFINITIONS

- A. The following words or terms contractions used for convenience throughout this specification are, unless specifically noted to the contrary, defined as follows:
 - 1. "Architect" means Patriquin Architects, New Haven, CT 06513.
 - 2. "Engineer" means Acorn Consulting Engineers, Inc., West Simsbury, CT 06092.
 - 3. "contractor" , as used herein, means the Prime Sub-contractor responsible for the work of that specific section of Division 232.
 - 4. "furnish" or "provide" or "supply" means to supply, erect, install, connect, test, and place into operation the particular item or work referred to unless otherwise specified.
 - 5. "work" means all of the labor, material, equipment, and supplies needed to fully execute the intent of this Specification.
 - 6. "Regulating authorities" or "authorities", means all governmental, utility and insuring authorities having jurisdiction.
 - 7. "piping" includes all pipe, fittings, valves, hangers, insulation, and other accessories relating to piping, and the labor to install same.
 - 8. "concealed" means hidden from view in chases, furred spaces, hung ceilings, embedded in construction, or buried underground. It is intended that all piping, equipment, and accessory items be concealed unless specifically indicated otherwise on the Drawings.

9. "exposed" means "not concealed" as defined above. work in tunnels, crawl spaces, within cabinetry, or otherwise accessible to view shall be considered "exposed" unless specifically noted otherwise.
10. "ductwork" means, in addition to ducts, all fittings, dampers, air control devices, hangers, flexible connectors and other accessories related to such ductwork.

1.5 DRAWINGS

- A. Drawings are generally diagrammatic and are intended to convey the scope and general arrangement of the work. Deviations from the depicted arrangement shall be approved by the Architect.
- B. Location of items shown on the Drawings, or called for in the Specifications, not definitely fixed by dimension, are approximate only. Exact location necessary to secure the best conditions and serviceability shall be determined in the field and shall have the review of the Architect.
- C. Follow the Drawings in laying out the work. Check Architectural, Structural, and other trade Drawings to verify spaces available so that maximum head room and service access can be maintained. Where space conditions appear inadequate, notify Architect before proceeding with the work.
- D. Work on the Drawings is intended to be approximately correct to the scale of the Drawings. Figured dimensions and large scale details shall take precedence over layouts on smaller scale Drawings. Dimensional information shall be taken only from the Architectural or Structural Drawings and details.
- E. Typical details shall apply to each and every occurrence of the item. Drawings make use of symbols and schematic diagrams to indicate and define various items of work. These have no dimensional significance, nor do they necessarily delineate each and every item required to make the work complete. Work shall be installed according to the diagrammatic intent of the Drawings, in conformity with the applicable dimensions, and as required by the finally approved shop and fabrication drawings.
- F. No interpretation shall be made from the limitations of symbols and diagrams that any necessary element or work has been excluded.
- G. If directed by the Architect or Owner, make reasonable modifications in the layout of the work to avoid conflict with work of other trades or for better execution of the work.
- H. Refer to Drawings and Specifications of all other trades to ascertain if any items provided or installed therein require work under this Division so that the final installation will be a complete job, ready for operation, completely coordinated and interconnected. It is understood that indication of any item on the Drawings or in the Specifications carries with it the instruction to furnish and install completely, regardless of whether this instruction

is explicitly stated.

- I. No statement in Drawings or Specifications, or any omission in either should be misunderstood as relieving the Contractor from providing a complete job. No inclusion, exclusion or limitation in the language of the Drawings or Specifications shall be interpreted as meaning that any required item or accessory necessary to complete any required system is omitted.
- J. The use of words in the singular shall not be considered as limiting where other indications allude to more than one item being needed.

1.6 VISITING THE SITE

- A. Prior to submitting a bid, visit the site of the work, inspect the Existing Building and conditions so as to determine if these conditions will affect the work. Bidders are cautioned that they will be held responsible for any assumptions made regarding existing conditions.

1.7 SUBSTITUTIONS

- A. Within thirty (30) days after Award of Contract, submit to the Architect for review a list of manufacturers of all materials and equipment proposed for use on the project. Indicate on submittal which items are substitutions.
- B. A review, without exception, of this list does not constitute approval, nor does it guarantee acceptance of the shop drawings when submitted.
- C. The Contractor's intent to purchase the exact make specified does not relieve him from the responsibility to submit this list. Failure to submit this list will require the Contractor to supply the exact item specified as the basis for design.
- D. Submittal of items which differ from those specified or indicated as the basis for design carries the implicit guarantee that the substituted item will provide the intended service and is compatible with other items or systems interfacing with it.
- E. When proposing a substitute item, the Contractor shall be responsible for all costs of accommodating the substitution, including, but not limited to, space and accessibility, modifications required to other systems, structural adequacy and the like.
- F. If substitutions require the Architect or Engineer to prepare sketches or revised drawings in order to become acceptable, the cost of such sketches, drawings, or engineering shall be borne by the Contractor.
- G. When substitutions require Engineer or Architect to spend an inordinate time for review of substitutions, the cost of review over four (4) hours will be charged to the Contractor who made the submittal.

1.8 SHOP DRAWINGS

- A. After acceptance of List of Manufacturers required under paragraph 1.0(A) of this Section, and prior to delivery of materials and equipment to the project site, submit copies of shop drawings of each item for review by the Architect.
- B. Each submittal shall contain a complete list of all materials contained within. Include intended use for each item.
- C. Shop drawings shall consist of manufacturer's scale drawings, cuts or catalogs, including descriptive literature and complete characteristics of equipment, including, but not limited to, dimensions, capacity, code compliance, motor and drive and testing, construction, electrical characteristics, support, all as required for this project.
- D. Architect may designate submittal of physical samples for review on items where actual color, texture or other characteristics might not be adequately described by a drawing or written material. Upon approval of a sample, each and every item of that sort must be identical to the approved sample.
- E. Certified performance curves shall be submitted for all fan and pumping equipment. Certified ratings shall be submitted for all operating equipment.
- F. Samples, drawings, specifications, catalogs, etc., submitted for review shall be labeled indicating specific service for which material or equipment is to be used, Section and Article Number of Specification governing, Contractor's name and name of project.
- G. Approval rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are reviewed, said review does not mean that drawings have been checked in detail; said review does not in any way relieve the Contractor from his responsibility of furnishing material or performing work according to Contract Documents.
- H. Failure to submit shop drawings in ample time for checking shall not be cause for an extension of Contract Time, and no claim by reason of such default will be allowed.
- I. Submittals for all systems which require the interconnection of three or more devices shall include a system block diagram. The diagram shall be of the one line type and with sufficient detail to show interfaces and method of operation.
- J. Material or equipment installed prior to review shall be liable for removal and replacement at no extra charge to the Owner if the material or equipment does not meet the intent of Drawings and Specifications.

1.9 EQUIPMENT AND MATERIALS

- A. Equipment and materials furnished or required shall be new, without blemish or fault. Equipment shall bear labels attesting to approval by Underwriters Laboratories, AGA, or

other recognized testing laboratory where specified or required to have such approval.

- B. Where no specific indication as to type or quality is indicated, a first-class article shall be furnished.
- C. All equipment of a type shall be products of a single manufacturer.
- D. Each item shall bear the manufacturer's nameplate showing name, ratings, model numbers and serial numbers. Nameplates of suppliers or distributors will not be acceptable.
- E. Provide line sized valves and unions or flanges on each pipe connection to items of equipment requiring piped connections.

1.10 RECORD DRAWINGS

- A. Obtain from the Architect a clean set of blue-line prints of the work and during construction indicate any deviations in routing, arrangement, elevation or size thereon.
- B. "As-Built" drawings shall be kept up to date concurrently with the execution of the work and turned over to the Architect for review and approval at the conclusion of the project. Failure to keep up to date on these drawings will require the Contractor to reconstruct his installations, make whatever investigations to accurately locate the installed work are needed, even if he has to cut into finished construction. All costs for this work shall be borne by the Contractor who failed to keep "as-built" drawings up to date.
- C. These drawings shall indicate the exact location and elevation of all utilities, sewers under floor slabs or buried on the site. Dimensions shall refer to the finished walls of the building or to finished grade or floor level. Include, as well, the final location of ducts and pipes concealed in chases, walls or above permanent ceilings.
- D. The location of all valves and cleanouts shall be indicated by dimension.

1.11 LAWS, ORDINANCES, CODES, PERMITS, FEES AND REGULATIONS

- A. Give all necessary notices, obtain all permits, pay all taxes and fees in connection with the work. File all Contract Documents, prepare documents and obtain all approvals of governmental departments having jurisdiction over the work. Obtain Certificates of Inspection and deliver to Architect before Application for Final Payment.
- B. Materials and workmanship shall comply with the rules and regulations of the National Board of Fire Underwriters, applicable Building and Life Safety Codes, the requirements of Boards of Health, Fire Insurance Rating Organizations, Local and State Fire Marshal, and the requirements of all governmental departments having jurisdiction. If contract requirements are in excess of the minimum standards of Codes, the Contract Provisions shall apply.
- C. Provide complete, working utility connections as described in 1.1 (D) above.

1.12 ROYALTIES AND PATENTS

- A. Pay all royalties and defend all suits and claims for infringement of any patent rights and save the Owner harmless on account thereof.
- B. If it is observed that a process or article specified is an infringement of a valid patent, promptly notify the Architect in writing. If work is performed knowing it is an infringement of a patent, all costs arising therefrom shall be borne by the Contractor.

1.13 STANDARD REFERENCES

- A. Certain items may be specified or indicated by reference to recognized standards. These may include the following:

AGA	American Gas Association
API	American Petroleum Institute
ASA	American Standards Association
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
AMCA	Air Moving and Conditioning Association
NBFU	National Board of Fire Underwriters
SBI	Steel Boiler Institute
IBR	Institute of Boiler and Radiator Manufacturers
STI	Steel Tank Institute
NACR	National Association of Corrosion Engineers
NEC	National Electrical Code
ETL	Electrical Testing Laboratories
NEMA	National Electrical Manufacturer's Association
PFMA	Power Fan Manufacturer's Association
UL	Underwriters Laboratories, Inc.
NFPA	National Fire Protection Association
FM	Factory Mutual Insurance Company
IRI	Industrial Risk Insurers
AABC	Associated Air Balance Council
IAPMO	International Association of Plumbing and Mechanical Codes

- B. The particular standard referred to shall be the latest legally defined revision to that standard.

1.14 INTERPRETATION OF PLANS AND SPECIFICATIONS

- A. Questions or disagreements arising as to interpretation of the intent of the Contract Documents, or the kind and quality of work required, shall be decided by the Architect whose interpretation shall be final, conclusive, and binding.

1.15 PROCEDURE OF WORK

- A. Work shall proceed in a planned, orderly manner as approved by the Architect.
- B. Procedure and scheduling of the work shall be coordinated with other trades as approved by the Architect, and may be adjusted from time to time to meet job conditions.

1.16 CHANGES TO THE WORK

- A. During the progress of the work, the Architect may make changes, alterations, additions or deletions to the drawn or specified work after having agreed to an equitable allowance to be added or deducted from the contract price.
- B. Claims for extra cost to cover extra work will not be allowed unless specifically authorized in writing by the Architect prior to the execution of such additional work.

1.17 COORDINATION OF TRADES

- A. Cooperate with other trades in the interchange of information and requirements in a timely manner.
- B. Participate in preparation of Project Coordination Drawings as more fully described in 1.01 (E), above.

1.18 PROTECTION OF WORK AND PROPERTY

- A. Be responsible for maintaining and protecting equipment and materials stored or installed at the project site, from loss or damage of all causes, until final acceptance by Owner.
- B. Be responsible for protection of finished work of other trades from damage or defacement caused by operations. Remedy all such damages at no cost to Owner.
- C. New roof penetrations shall conform with the existing roof system manufacturer's requirements. Provide documentation from the existing roofing system manufacturer at the completion of the project to indicate the integrity of roofing system has been maintained, and that the roof warranty is in force for the remaining warranty period. Provide all material, labor, testing and expenses necessary to satisfy the roofing system manufacturer's requirements so to maintain the Owner's roof bond.

1.19 CUTTING, PATCHING, PAINTING, EXCAVATING AND BACKFILLING

- A. Cutting, patching, painting, excavating and backfilling shall be done under other Divisions unless specifically noted otherwise.
- B. Make sure that sleeves are set, chases and openings provided for, and trenching requirements are established so not to delay progress of the project.

- C. Failure to provide information to other trades making it necessary to cut or patch finished work shall be cause for the cost of the cutting and patching to be borne by the Contractor failing to provide the information.

1.20 TEMPORARY OPENINGS

- A. Determine if any temporary openings will be required for admission of equipment or materials and notify the Architect of these requirements.
- B. Failure to give sufficient notice to arrange for these openings shall result in this Contractor's assumption of all costs associated with making and repairing such temporary openings.

1.21 PIPE EXPANSION

- A. Install piping systems to allow for freedom of movement during expansion and contraction without springing. Provide swing joints, expansion joints, loops, or compensators, complete with guides, where necessary to allow for expansion or contraction.

1.22 INSTRUCTION BOOKS AND OPERATING INSTRUCTIONS

- A. Furnish three (3) sets of Operating and Maintenance Manuals in hard cover covering all Mechanical Systems in the project. Include manufacturer's approved submittal of each item. Submit for review of Architect.
- B. Manuals shall contain, as a minimum, the following:
 - 1. Description of the project and major sub-systems.
 - 2. Descriptive text covering the filling, purging, starting, and adjusting of each system, and procedures for shutting down and making systems secure.
 - 3. Copies of all valve tag lists and equipment schedules.
 - 4. Copies of all control system diagrams and description of operation.
 - 5. A schedule of maintenance based on the manufacturer's recommendations, showing what work is to be performed and at what intervals.
 - 6. Copies of the finally approved submittal for each item, together with the manufacturer's installation, operation, and maintenance instructions and parts lists.
 - 7. List of Firm names, addresses, telephone numbers to be contacted for regular or emergency service, or purchase of parts.

- C. Manuals shall be arranged in one or more three-ring binders, completely indexed as follows:
 - 1. General information; Items 1, 2, 3, & 7 above.
 - 2. Control system information; Item 4.
 - 3. Approved submittal, maintenance, and parts information; Items 5 & 6.
 - 4. Each Section shall be identified by a permanent index tab.
 - 5. Each item within a major Section shall be separately indexed for quick reference.
- D. Provide adequate written and/or verbal instructions to the Owner's operating personnel and such others as the Owner may designate. As a minimum, provide for three (3), eight hour working days of instructions. Individual equipment or systems may require additional or different periods of instruction.

1.23 ACCESSIBILITY

- A. Install work so that all parts are readily accessible for inspection, maintenance and service.
- B. Locate connections, valves, unions, strainers, etc. so as to be readily accessible.
- C. Where items are located in non-access spaces (ceilings, tunnels, chases), provide approved access doors or panels. Group items requiring access to limit the number of access points.
- D. Access doors shall have the same fire rating as the wall, floor, or ceiling involved. Doors shall be of size required, but no less than 12" X 12" minimum size. Access doors shall be delivered to the Contractor for installation.

1.24 ELECTRICAL WORK FOR MECHANICAL TRADES

- A. Each trade supplying electrically operated equipment for installation and wiring under Division 16 shall furnish sufficiently detailed information and wiring diagrams in a timely manner.
- B. Equipment including a number of electrical items in a single enclosure or a common base shall be supplied internally wired as a unit to numbered terminals.
- C. Electrical devices having a mechanical element such as a float valve, pressure switch, etc., shall be installed and mechanically connected under this Division and left ready for wiring under Division 26.

1.25 MOTORS AND MOTOR CONTROLS

- A. Motors shall conform to all applicable regulations and be suitable for the load, duty,

voltage characteristics, service, and location intended.

- B. Unless otherwise specified, motors shall be rated for continuous duty at rated service factor with a temperature rise not exceeding NEMA standards. Motors shall be able to withstand momentary overloads of 125% of rating without damage or overheating.
- C. Motors 1/3 HP and smaller shall be capacitor start, capacitor run or permanent split capacitor type, designed to run at 120 volts, 1 phase, 60 hertz.
- D. Each trade furnishing motor driven equipment shall provide an approved starting device and deliver same to electrical Contractor for installation and wiring.
- E. Single phase motor starters shall be manual "TT" type toggle switch with melting alloy overload device, unless otherwise indicated.
- F. Polyphase motor starters shall be solid state type soft start equivalent to Allen-Bradley SMC-Flex. The starter shall include electronic overload, integral bypass, modular communication capabilities, motor starting capabilities for both star-delta and standard squirrel-cage induction motors, advanced protection and diagnostics in a compact, maintainable, modular package. The bypass minimizes heat generation during run time and automatically closes when the motor reaches its nominal speed. Features shall include built-in SCR bypass/run contactor, built-in electronic motor overload protection, CT on each phase, metering, LCD display, keypad programming and four programmable auxiliary contacts. Starters shall meet and have the approval of the following standards: UL 508, EN/IEC 60947-4-2, CE Marked (open type) per EMC Directive and Low Voltage Directive. The following are the modes of operation to be provided: Soft Start. Selectable kick-start, current limit start, dual ramp start, full voltage start, linear speed acceleration, preset slow speed, and pump control-start & stop. The starter shall provide the following motor control features: electronic motor overload protection, stall protection and jam detection, underload protection, undervoltage protection, overvoltage protection, voltage unbalance protection, excessive start protection. The starter shall meter current for each phase, power factor, voltage for each phase, motor thermal capacity usage, power in KW, elapse time and power usage in kWH. A serial interface port shall allow connection to a Bulletin 20 Human Interface Module.
- G. Single phase motors requiring automatic control interlocking shall be solid state type soft start having the same requirements as polyphase motor starters.
- H. Provide, for each starter requiring automatic control, one normally open and one normally closed auxiliary contact.
- I. All motor starters shall be furnished in NEMA 1 enclosure with reset button in cover unless otherwise indicated elsewhere.
- J. Certain large or special purpose motors may require reduced voltage starting. In this case, the appropriate section of the equipment specifications will give complete specifications on the type of motor controller required.

- K. All motor starters being automatically controlled shall be provided with a fused control circuit transformer, 120 or 24 volts as required by control system. Control circuit transformers shall also be provided in all starters operating at line voltages over 250 volts, whether or not automatically controlled.
- L. Provide premium energy efficient motors. Motor name plates shall indicate the nominal efficiency per NEMA Standard MG-12.54. Minimum efficiency shall be as follows:

1. Open Drip Proof (ODP)

Motor Size Horsepower	Speed (RPM)		
	1,200	1,800	3,600
1	82.5	85.5	77.0
1.5	86.5	86.5	84.0
2	87.5	86.5	85.5
3	88.5	89.5	85.5
5	89.5	89.5	86.5
7.5	90.2	91.0	88.5
10	91.7	91.7	89.5
15	91.7	93.0	90.2
20	92.4	93.0	91.0
25	93.0	93.6	91.7
30	93.6	94.1	91.7
40	94.1	94.1	92.4
50	94.1	94.5	93.0
60	94.5	95.0	93.6
75	94.5	95.0	93.6
100	95.0	95.4	93.6
125	95.0	95.4	94.1
150	95.4	95.8	94.1
200	95.4	95.8	95.0

2. Totally Enclosed Fan Cooled (TEFC)

Motor Size Horsepower	Speed (RPM)		
	1,200	1,800	3,600
1	82.5	85.5	77.0
1.5	87.5	86.5	84.0
2	88.5	86.5	85.5
3	89.5	89.5	86.5
5	89.5	89.5	88.5
7.5	91.0	91.7	89.5
10	91.0	91.7	90.2
15	91.7	92.4	91.0
20	91.7	93.0	91.0
25	93.0	93.6	91.7
30	93.0	93.6	91.7

40	94.1	94.1	92.4
50	94.1	94.5	93.0
60	94.5	95.0	93.6
75	94.5	95.4	93.6
100	95.0	95.4	94.1
125	95.0	95.4	95.0
150	95.8	95.8	95.0
200	95.8	96.2	95.4

1.26 TESTS

- A. Test all piping and equipment as required by the various Sections of the Specifications.
- B. Tests to be witnessed by and be to the satisfaction of the Architect or his designee, and others having legal jurisdiction.
- C. Pressure tests shall be applied to piping before insulating and before connecting to equipment having pressure ratings lower than the test pressure.
- D. Work shall be tested, repaired, and retested until an approved test is achieved.
- E. Damages caused by testing or failure of a test shall be repaired to the satisfaction of the Architect, at no cost to the Owner.
- F. In general, piping systems shall be tested to 150% of the maximum expected operating or surge pressure, or 125 psi, whichever is greater. Utility connections shall be tested in accordance with the Utility's requirements.
- G. Completed systems shall be tested to demonstrate proper operation, capacity, and acceptable noise and vibration levels. Insofar as possible, systems normally operated during certain seasons of the year shall be tested during that season.
- H. Costs for all testing shall be borne by the appropriate Contractor.

1.27 QUIET OPERATION

- A. Fans and motors shall be isolated from the building structure by approved means. Noise and hum of equipment shall be absorbed or attenuated so as not to be objectionable.
- B. Where noise or vibration levels are considered objectionable by the Architect, they shall be corrected at no additional cost to the Owner.

1.28 USE OF INSTALLATION BY OWNER

- A. Owner shall have the privilege of using any part of the work when sufficiently complete, but such use shall not be considered as an acceptance of the work in lieu of a written certificate from the Architect.

1.29 CLEANUP

- A. Piping, ducts and equipment shall be thoroughly cleaned, inside and out, before being placed into operation.
- B. Any stoppage in a system shall be removed and any work damaged in the course of such removal shall be restored to its original condition at no additional cost to the Owner.
- C. Keep site free from accumulation of waste materials or rubbish. Periodically clean work areas. At conclusion of work remove all tools, construction equipment, surplus materials from the site and leave in clean condition.

1.30 GUARANTEE AND SERVICE

- A. Guarantee all work to be free from defects in workmanship and/or materials and that all apparatus will achieve the capacity and characteristics specified. If during the period of One (1) Year (or other term specified elsewhere) from certificate of completion of the work, defects appear, remedy such defects without cost to the Owner. In default thereof, the Owner may have such corrective work done and charge the cost to the Contractor. Indemnify Owner for property damage which might result from such a defect which made repairs necessary.
- B. Certain equipment will require guarantee periods exceeding one year due to the need for seasonal operation. In such case, the guarantee period shall extend through one, complete, continuous operating season.
- C. Air conditioning compressors shall be furnished with the Manufacturer's Extended Warranty covering five (5) years from date of project acceptance. Deliver warranty certificate to Owner's authorized representative.

1.31 INSURANCE

- A. Fully insure all employees, material and finished work as required by the General Conditions of the Contract.

1.32 SCAFFOLDING, RIGGING, HOISTING

- A. Unless otherwise indicated, the work or each Section shall include all scaffolding, rigging, hoisting and services necessary to deliver, install, erect in place all items of equipment. Remove such handling materials when no longer needed.

END OF SECTION 230550

SECTION 230700 - INSULATION SYSTEMS

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 SCOPE OF WORK

- A. This Section describes various insulation materials and accessories used for the Project's Mechanical Systems.
- B. Refer to the Schedules at the end of this Section for the selection of insulation systems applicable to this Project.

1.3 RELATED WORK

- A. This Section is to be used in conjunction with the provisions of all other Sections of Division 23, especially Section 230550, Common Work Results for HVAC.

1.4 SUBMITTALS

- A. Provide submittals for review in accordance with the provisions of Section 230500.
- B. Submit schedule of insulating materials to be utilized.
- C. Submit manufacturer's installation instructions under provisions of Section 230500.
- D. Describe installation methods that will be used to install duct insulation, liners and accessories.

1.5 QUALITY ASSURANCE

- A. All items provided under the provisions of this Section shall be new and shall be the products of recognized manufacturers of that item.
- B. Applicator shall be a Company specializing in insulation applications with a minimum of three years experience.
- C. Material flame spread/fuel contributed/smoke developed rating of 25/50/50 in accordance with NFPA 255. Insulation jacket shall be legibly printed by the manufacturer to show nominal thickness, r-value, type insulation, flame spread and smoke development.

1.6 DELIVERY, STORAGE AND PROTECTION OF MATERIAL

- A. All insulation material and accessories shall be stored in a safe, dry location. No insulation material shall be installed that has become damaged in any way.
- B. If any insulation material has become wet because of job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site. Any installed insulation material that has become wet after installation shall be replaced with new insulation.
- C. Maintain ambient temperatures and conditions required by manufacturers of adhesive and insulation.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The following material describes the requirements and materials for various items included in the Project's Mechanical systems.
- B. It should be noted that this particular Project may not include all of the items listed. Refer to the Schedules at the end of this Section for those items specific to this Project.
- C. Insulation material and accessories shall be products of nationally recognized manufacturers.

2.2 TYPE 'A' PIPE INSULATION

- A. Preformed flexible elastomeric cellular thermal insulation; 'k' value of 0.27 at 75 °F; operating range of -40 °F to 220 °F.
- B. Adhesive: air-drying contact adhesive to join seams and butt joints.
- C. Insulation tape is made of the same elastomeric cellular material as the insulation. Tape is supplied in 2 inch wide by 1/8 inch thick form.
- D. Protective finish: white water-based latex enamel suitable for both indoor and outdoor application to insulation. Finish shall be exceptionally durable and resistant to weather.

2.3 ACCESSORY MATERIAL

- A. Accessory materials installed as part of insulation work under this Section shall include but not be limited to closure materials, insulation bands, insulating cement, finishing cement, jacketing materials, support materials, fasteners, and adhesives.
- B. All accessory materials shall be installed in accordance with the Contract Drawings, manufacturer's instructions and/or conformance with the current edition of the Midwest Insulation Contractors Association (MICA) "Commercial & Industrial Insulation Standards".

PART 3 - EXECUTION

3.1 PREPARATION

- A. Ensure that all surfaces over which insulation is to be applied are clean and dry.
- B. Ensure that insulation is clean, dry and in good mechanical condition with vapor or weather barriers intact and undamaged.
- C. Ensure that testing mechanical systems have been completed prior to installing insulation.

3.2 GENERAL INSTALLATION

- A. Install materials in accordance with manufacturer's printed instructions.
- B. Continue insulation having vapor barrier through penetrations and sleeves undiminished in thickness. Extend insulation without interruption through walls, floors, and similar pipe penetrations, except where otherwise specified. Extend ductwork insulation without interruption through walls and floors, except where interrupted by fire and smoke dampers, and where noted otherwise.
- C. Locate insulation and cover seams in least visible locations.
- D. On insulated piping with vapor barrier, insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- E. On insulated piping without vapor barrier and piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment connections, but bevel and seal ends of insulation at such locations.
- F. Provide an insert, not less than 6 inches long, of same thickness and contour as adjoining insulation, between support shield and piping, but under the finish jacket, on piping 2 inches diameter or larger, to prevent insulation from sagging at point of support. Inserts shall be cork or other heavy density insulating material suitable for the planned temperature range. Factory fabricated inserts may be used.
- G. Neatly finish insulation at supports, protrusions, and interruptions. Install insulation, covers and accessories so that they have an attractive, neat appearance.
- H. All insulation ends shall be tapered and sealed, regardless of service.
- I. Maintain the integrity of factory-applied vapor barrier jacketing on all insulation, protecting it against puncture, tears or other damage. All staples used on cooling or dual temperature ductwork insulation shall be coated with suitable sealant (as recommended by the insulation manufacturer) to maintain vapor barrier integrity.
- J. Install insulation and covering so that it has an attractive, neat appearance.

- K. Install insulation materials with smooth and even surfaces. Butt joints firmly together to ensure complete and tight fit over surfaces to be covered.
- L. Protect outdoor insulation from weather by installing outdoor protective finish or jacketing as recommended by the insulation manufacturer.
- M. Do not insulate over nameplate or ASME stamps. Bevel and seal insulation around such.
- N. When equipment with insulation requires periodical opening for maintenance, repair, or cleaning, install insulation in such a manner that it can be easily removed and replaced without damage.
- O. All exhaust piping within building and piping within 12 feet of grade at the building exterior shall be insulated and jacketed. Jacketing located outdoors shall be sealed water-tight. Exhaust piping 12 feet and higher above grade shall not be insulated.

3.3 TYPE 'A' PIPE INSULATION

- A. Unslit tubular form can be slipped onto piping before it is connected, or can be slit length wise and applied over piping already connected. Fitting covers are fabricated from miter-cut tubular form. Butt joint and seams are to be joined with insulation manufacturer's supplied adhesive and sealed with the manufacturer's supplied tape. Cover valves, flanges, etc. with oversized insulation.
- B. Provide the insulation manufacturer's protective finish on pipe insulation exposed to the outdoors.
- A. Provide PVC fitting covers/pipe jacketing on insulated piping and fittings exposed within the building. PVC fitting covers and jacketing shall be bonded together with the manufacturer's recommended adhesive to form a completely sealed covering system.

3.4 ACCESSORY MATERIALS

- A. All accessory materials shall be installed in accordance with the Contract Documents, the manufacturer's printed installation instructions, and in conformance with the current edition of the Midwest Insulation Contractors Association (MICA) "Commercial & Industrial Insulation Standards".

3.5 PIPE INSULATION SCHEDULE

SERVICE	TYPE	PIPE SIZE	THICKNESS
Condensate	B	All	1/2"
Refrigerant Piping	B	All	1"

END OF SECTION 230700

SECTION 230800 - COMMISSIONING OF SYSTEMS

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 SCOPE OF WORK

- A. Owner Instructions.
- B. Operation and Maintenance Manuals.
- C. "As Built" Drawings.

1.3 RELATED DOCUMENTS

- A. Section 230500 - Common Work Results for HVAC..
- B. All other Sections in Division 23.

1.4 QUALITY ASSURANCE

- A. Operation and Maintenance Manuals and "As-Built Drawings" shall be reviewed by the Engineer prior to turning over to Owner. Refer to Section 230500 - General Provisions-Mechanical.

PART 2 - PRODUCTS

- 2.1 None required.

PART 3 - EXECUTION

- 3.1 None required.

END OF SECTION 230800

SECTION 233000 - BASIC MATERIALS & METHODS

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 SCOPE OF WORK

- A. This Section describes various basic materials and equipment for use in the Project's Mechanical Systems.
- B. Refer to the Schedules at the end of this Section for the selection of vibration isolation, and piping systems applicable to this Project.
- C. Work included under this Section shall include, but not be limited to: Piping and fittings, ductwork, valves, hangers, supports, sleeves, fire stopping systems, mechanical identification, seismic bracing, vibration isolation, ductwork access doors, volume dampers, fire dampers, and combination fire/smoke dampers.
- D. Coordination utilizing ductwork erection drawings.

1.3 RELATED WORK

- A. This Section is to be used in conjunction with the provisions of all other Sections of Division 23, especially Section 230500 Common Work Results for HVAC.
- B. Refer also to any applicable portions of Division 26, Electrical Work.

1.4 SUBMITTALS

- A. Provide submittals for review in accordance with the provisions of Section 230500.
- B. Submit manufacturers installation instructions under Section 230500.
- C. Submittals are required for the following:
 - 1. Schedule of valve types proposed for each scheduled service.
 - 2. Schedule of pipe and fitting types proposed for each service scheduled.
 - 3. Schedule of vibration isolation for each unit and service scheduled.
- D. Submit sketches of proposed seismic bracing systems for equipment, including loads, etc. Sketches and calculation submittals shall bear the seal and signature of a structural engineer licensed in the State of Connecticut.

- E. Provide documentation that vibration isolators and anchor bolts will have properties sufficient to withstand required forces.
- F. Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- G. Submit a shop drawing indicating vibration isolator locations, with static and dynamic load on each isolator and description of product data.
- J. Prepare and submit for approval, Variable Refrigerant Flow Air Conditioning Systems Installation Coordination Drawings drawn to 1/4"=1'-0" or larger. Coordinate all mechanical, electrical, structural, and architectural services including those which are existing, in proximity to VRF piping, wiring and equipment. Coordination Drawings shall be reviewed and signed-off by all affected trades prior to submission, and shall show new and existing building elements in proximity to VRF system components. The Contractor shall show Drawing Sections throughout areas where conflicts occur. The Contractor must field verify existing conditions, as the Contract Drawings do not necessarily reflect 'AS-BUILT' conditions. As a minimum these Coordination Drawings shall show ceiling grids, mechanical equipment, light fixtures, sprinkler heads, and structure. Indicate the above finish floor ceiling heights on the Coordination Drawings. Dimension the location of ductwork, piping and equipment off the structural grid. Elevation dimensions must be taken from the finished floor.

1.5 QUALITY ASSURANCE

- A. All items provided under the provisions of this Section shall be new, of domestic manufacture, and shall be the products of recognized manufacturers of that item.
- B. All items of a similar class shall be the products of the same manufacturer. That is, all valves, all accessory items, etc. shall be from the same source.
- C. Maintain ASHRAE criteria for average noise criteria curves for all equipment at full load condition for selection of vibration isolators.
- D. Firestopping shall conform to ASTM E-814, "Standard Method of Fire Tests of Through Penetration Fire Stops".

PART 2 - PRODUCTS

2.1 GENERAL

- A. The following describes the requirements and materials for various items included in the Project's Mechanical systems.
- B. It should be noted that this particular Project may not include all of the items listed. Refer to the Valve and Materials Schedules at the end of this Section for those items specific to this Project.

2.2 PIPE AND TUBING

Schedule at end of this Section will refer to required types of pipe or tubing by letter designation according to the following list:

- A. Steel, Black & Galvanized; ASTM A-53 or A-120; Plain or threaded ends. Each length mill coated and capped.
- B. Copper Tube; Types L seamless for refrigerant lines. Shall be of domestic origin. Contractor shall provide certificate of origin.

2.3 PIPE FITTINGS

Schedule at end of this Section will refer to required types of pipe or tubing fittings by letter designation according to the following list:

- A. Wrought Copper, solder joint, pressure fittings, ANSI/ASME B16.22.
- B. Wrought Copper and Wrought Copper Alloy, solder joint drainage fittings, ANSI/ASME B16.29.

2.4 SLEEVES

- A. Sleeves for Pipes Through Non-fire Rated Floors: Form with 18 gage galvanized steel.
- B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with Schedule 40 steel pipe.
- C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Schedule 40 steel pipe.
- D. Sleeves for Round Ductwork: Form with galvanized steel.
- E. Sleeves for Rectangular Ductwork: Form with galvanized steel.

2.5 FIRESTOPPING SYSTEMS

- A. Provide material/system classified by UL to provide firestopping equal to time rating of construction being penetrated.
- B. Firestopping system shall not emit toxic or combustible fumes, and be capable of maintaining an effective barrier against flame, smoke water and toxic gases in compliance with ASTM E-814 under their designation of UL 1479.
- C. Firestopping systems shall be flexible to allow for normal movement of building structure and penetrating items without affecting the adhesion or integrity of the system.
- D. Stuffing and Fire Stopping Insulation: Glass fiber type, non-combustible.

- E. Firestop Sealant: An adhesive, one-part, silicone based, elastomeric sealant.
- F. Intumescent Wrap: An aluminum foil-backed intumescent strip for plastic pipe, insulated pipe or other combustible penetrating items.
- G. Damming Material: Adhesive filling and sealing foam, fire-resistant mineral fiber.

2.6 PIPE AND EQUIPMENT SUPPORTS

- A. Hangers for Pipe Sizes ½ to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
- C. Hangers for Pipe Sizes 5 Inches and Over: Adjustable steel yoke, cast iron roll, double rod hanger.
- D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods; cast iron roll and stand for pipe sizes 6 inches and over.
- E. Wall Support for Pipe Sizes ½ to 2 Inches: Welded steel bracket and wrought steel clamp; adjustable clevis.
- F. Vertical Support: Steel riser clamp, adjusting screws sizes 4 inches and larger.
- G. Floor Support for Pipe Sizes 2-1/2 to 5 Inches: Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.
- H. Floor Support for Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
- I. Copper Pipe Support: Carbon steel clevis, adjustable, copper plated.
- J. Shield for Insulated Piping 2 Inches and Smaller: 18 gauge galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.
- K. Shield for Insulated Piping 2-1/2 Inches and Larger (Except Cold Water Piping): Pipe covering protective saddles.
- L. Shields for Insulated Cold Water Piping 2-1/2 Inches and Larger; Hard block non-conducting saddles in 90 degree segments, 12 inch minimum length, block thickness same as insulation thickness.
- M. Shields for Vertical Copper Pipe Risers: Sheet lead.

2.7 INSERTS

- A. Inserts: Malleable iron or galvanized steel shell and expander plug for threaded connection

with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.8 HANGER RODS

- A. Steel Hanger Rods: Threaded both ends, threaded one end, or continuous threaded.

2.9 IDENTIFICATION MATERIALS

- A. Unless specified otherwise, identification shall conform with ANSI/ASME A13.1.
- B. Plastic Nameplates: Laminated three-layer plastic with engraved white letters on dark contrasting background.
- C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- D. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, performed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and fluid being conveyed.
- E. Plastic Pipe Tape Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.10 SEISMIC BRACING

- A. Bracing shall be fabricated from standard structural or trade sections.
- B. Attachments to masonry walls shall be by means of expansion shields and bolts.
- C. Attachment to building structure shall meet approval of Structural Engineer.

2.11 VIBRATION ISOLATION

- A. Type 1: Spring hanger rods based on Mason type PC30N hanger, shall incorporate the following:
 - 1. Vibration hanger shall be closed spring type with neoprene element in series with a steel spring separated from the housing with neoprene stabilizer.
 - 2. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30° arc before contacting the hole and short circuiting the spring.
 - 3. Springs shall be pre-compressed to the rated deflection to keep piping or equipment at a fixed elevation during installation. The hangers shall have a release mechanism to free the spring after the installation is complete.
 - 4. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection.

- B. Type 2: Spring isolators based on Mason type SLF isolator, shall incorporate the following:
1. Reserve deflection from loaded to solid height of 50% of rated deflection.
 2. Minimum 1/4" thick neoprene acoustical base pad on underside.
 3. Spring diameters shall be no less than 0.8 of the compressed height of the spring of the spring at rated load.
 4. Non-resonant with equipment forcing frequencies or support structure natural frequency.
- C. Type 3: Spring isolator based on Mason type SLR, shall be the same as Type 2, except:
1. Provide built-in vertical limit stops. Limit stops shall be out of contact during normal operation.
 2. Tapped holes in top plate for bolting to equipment.
 3. Capable of supporting equipment at a fixed elevation during equipment erection. Installed and operating heights shall be equal.
 4. Adjustable spring pack with separate neoprene pad isolation.
- D. Type 4: Spring hanger rod isolators based on Mason type HS, shall incorporate the following:
1. Spring element seated on a steel washer within a neoprene cup with a rod isolation bushing.
 2. Steel retainer box encasing the spring and neoprene cup.
- E. Type 5: Elastomer hanger rod isolators based on Mason type HD, shall incorporate the following:
1. Molded unit type neoprene element with projecting bushing lining rod clearance hole.
 2. Neoprene element to be minimum 1-3/4" thick.
 3. Steel retainer box encasing neoprene mounting.
 4. Minimum static deflection of 0.35".
- F. Type 6: Combination spring/elastomer hanger rod isolators based on Mason type DNHS, shall incorporate the following:
1. Spring and neoprene isolator elements in a steel box retainer. Neoprene of double deflection type. Spring seated in a neoprene cup with extended rod bushing.
 2. Characteristics of spring and neoprene as described in Type 2 and Type 5.
- G. Type 7: Elastomer mount isolators based on Mason type ND, shall incorporate the following:
1. Neoprene element, double deflection type.
 2. Maximum static deflection of 0.35".
 3. Threaded insert and hold down holes with cap screws and washer.

- H. Type 8: Pad type elastomer mountings based on Mason type Super W, shall incorporate the following:
 - 1. 3/4" minimum thickness.
 - 2. Rubber pad, ribbed or waffled design. Use neoprene in oily or exterior locations.
 - 3. 50 psi maximum loading, 0.10" deflection per pad, 50 durometer.

- I. Type 9: Pad type elastomer mountings based on Mason type WSW, shall incorporate the following:
 - 1. Steel shims cemented between 5/16" thick neoprene pads layered to achieve thickness.
 - 2. Ribbed or waffled design, 40 durometer.

- J. Type 10: Spring seismic restraint based on Mason type SSLFH, shall incorporate the following:
 - 1. Characteristics of spring and neoprene isolator as described in Type 2.
 - 2. Snubbing shall take place in all modes with adjustment to limit travel to a maximum of 1/4" before contacting snubbers.
 - 3. Mountings shall have a minimum rating of 1G as calculated by a registered structural engineer.
 - 4. All mountings shall have leveling bolts and be capable of supporting equipment at a fixed elevation during erection.

- K. Provide pairs of neoprene side snubbers or restraining springs where side torque or thrust may develop.

- L. Provide color code spring mounts.

- M. Select springs to operate at 2/3 maximum compression strain, with 1/4 inch ribbed neoprene pads.

- N. Provide side restraint and/or snubbers in all horizontal directions where required for equipment installation.

- O. Victaulic Style 75 or 77 flexible couplings may be used in lieu of flexible connectors for vibration isolation at equipment connections. A minimum of three (3) couplings, for each connector, shall be placed in close proximity to the source of vibration.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

- A. Install in accordance with manufacturer's printed installation instructions.

B. Offsetting/Pitching/Drains & Vents

3.2 PIPE INSTALLATION

A. Preparation:

1. Ream pipe and tube ends. Remove burrs.
2. Remove scale and dirt, inside and outside, before assembly.
3. Remove welding slag or foreign material from pipe and fitting materials.

B. Copper Pipe Connections:

1. Form hot soldered joints in copper, brass, or bronze fittings with non-lead solder. Clean joints prior to fluxing. Use only non-acid fluxes.
2. Make connections to equipment and branch mains with unions. (Unions are not required in installations using grooved mechanical couplings. (The couplings shall serve as unions.)

3.3 HANGER INSTALLATION

A. No chains, wood blocks, wire, or cold bent brackets may be used for support.

B. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.

C. Place a hanger within 12 inches of each horizontal elbow.

D. Use hangers with 1-1/2 inch minimum vertical adjustment. Provide jam nut to lock adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

F. Support vertical piping at every other floor. Support vertical cast iron pipe at each floor at hub.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Design hangers to be adjustable or removable without disconnecting of supported pipe.

J. Provide copper plated hangers and supports for copper piping.

3.4 SLEEVE/INSERT INSTALLATION

A. Set sleeves in position in form work. Provide reinforcing around sleeves as required.

- B. Extend sleeves through floors 2 inches above finished floor level. Calk sleeves full depth. In dry finished areas set sleeves flush with floor, calk, and provide approved escutcheon plate.
- C. Where piping or ductwork penetrates floor, ceiling or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and sealant. Provide close fitting chrome plated escutcheon covers at both sides of penetration. Sealant and packing shall be of a type which shall maintain the fire resistive rating of the member being penetrated.
- D. Install chrome plated steel escutcheons at finished surfaces.
- E. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- F. Size sleeves for insulated piping and ductwork to allow insulation to pass through sleeve undiminished in thickness. Provide intumescent fire stopping at fire rated walls.

3.5 IDENTIFICATION INSTALLATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners, or adhesive. Drilled holes for mechanical fasteners, NO holes if adhesive is used.
- C. Metal Tags: Install with corrosive-resistant chain.
- D. Plastic Pipe Markers: Install in accordance with manufacturer's instructions.
- E. Plastic Tape Pipe Markers: Install completely around pipe in accordance with manufacturer's instructions.
- F. Equipment: Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices such as in-line pumps, may be identified with metal tags.
- G. Controls: Identify control panels and major control components outside of panels with plastic nameplates.
- H. Valves: Identify valves in main and branch piping with tags.
- I. Piping: Identify piping, concealed or exposed, with plastic pipe markers or plastic tape pipe markers. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.
- J. Provide valve chart and schedule in aluminum frame with clear plastic shield. Chart to

include valve number, service, size, and purpose of valve. Install where directed.

- K. Submit valve charts and schedules for review prior to installation. Include copies in Maintenance Manuals.

3.6 TESTING

- A. Test all piping and equipment as required by the various Sections of the Specifications.
- B. Tests to be witnessed by and be to the satisfaction of the Architect or his designee, and others having legal jurisdiction.
- C. Pressure tests shall be applied to piping before insulating and before connecting to equipment having pressure ratings lower than the test pressure.
- D. Work shall be tested, repaired, and retested until an approved test is achieved.
- E. Damages caused by testing or failure of a test shall be repaired to the satisfaction of the Architect, at no cost to the Owner.
- F. In general, piping systems shall be tested to 150% of the maximum expected operating or surge pressure, or 125 psi, whichever is greater. Utility connections shall be tested in accordance with the Utility's requirements.
- G. Completed systems shall be tested to demonstrate proper operation, capacity, and acceptable noise and vibration levels. Insofar as possible, systems normally operated during certain seasons of the year shall be tested during that season.
- H. Costs for all testing shall be borne by the contractor.

3.7 SEISMIC BRACING

- A. Provide lateral bracing in all directions for all equipment, piping, ductwork, etc., sufficient to resist the lateral forces determined under Connecticut Building Code.
- B. SMACNA standard details may be used for bracing of piping and ductwork without calculations. NFPA 13 standard details for seismic bracing of sprinkler piping may be used without calculations. However, other bracing schemes may be used when submitted with calculations.
- C. A separate calculation shall be made for each equipment item.
- D. Provide bracing for all suspended or base mounted equipment, pipes, and ductwork
- E. Attachments to building elements shall only be made at locations having sufficient strength and rigidity to absorb the forces calculated.
- F. For suspended equipment provide bracing such that the effectiveness of the equipment

vibration isolators is not reduced.

- G. Vibration isolators, where called for, shall have sufficient lateral stability to resist the forces involved.
- H. Base mounted equipment attached directly to the structure, or on foundation or housekeeping pads, shall be provided with anchor bolts having sufficient strength in shear to absorb the calculated lateral forces in all directions.
- I. Isolated, base mounted equipment shall, in addition to verification of anchor bolt strength, have isolation having lateral stability and snubbing capacity to absorb the calculated lateral forces in all directions.
- J. Where not excluded, provide lateral bracing for piping and ductwork.
- K. Where bracing of piping is required, normal anchors and guides provided to absorb thermal expansion shall be considered as meeting the intent of this Section.
- L. Where required, bracing for piping and ductwork can be made to an intermediate hanger structure located within 12" of the top of the pipe or duct.
- M. Locate and install bracing so that access to the equipment for service, maintenance and repair will not be impeded. Bracing shall be arranged so that there will be no impediment to removal or replacement of the entire unit or piece of equipment.
- N. In Victaulic grooved piping systems, seismic movement of piping systems shall be accommodated by installing swing joints consisting of flexible couplings, pipe nipples and elbows that provide simultaneous movement in all directions, or other seismic movement compensation devices such as loops, offsets, or Style 155 expansion joints to provide flexibility to the system and help reduce pipe stress. Refer to Victaulic design submittal #26.12.

3.8 VIBRATION ISOLATION

- A. Install vibration isolators for motor driven equipment.
- B. Set steel bases for one inch clearance between housekeeping pad and base. Adjust equipment level.
- C. Provide spring isolators on piping connected to isolated equipment as follows: Up to 4 inch diameter, first three points of support; 5 to 8 inch diameter, first four points of support; 10 inch diameter and over, first six points of support. Static deflection of first point shall be twice deflection of isolated equipment.
- D. Victaulic Style 75 or 77 flexible couplings may be used in lieu of flexible connectors for vibration isolation at equipment connections. A minimum of three (3) couplings, for each connector, shall be placed in close proximity to the source of vibration.

3.9 FIRESTOPPING INSTALLATION

- A. Furnish all materials and labor required for installation of through penetration firestop systems around pipe, duct, cable, conduit, and tubing openings at fire-rated walls, floors, partitions, and floor/ceiling assemblies.
- B. Each penetration shall be reviewed by the Contractor as to it's UL designation and construction conditions and the appropriate firestop system applied to maintain the required rating

3.10 PIPING SCHEDULE

SERVICE	SIZE	MATERIAL	FITTINGS	JOINT
Condensate	All	Type 'L' Copper or 40 S, Polyvinyl Chloride (PVC)	Wrought	Soldered/Press
Refrigerant***	All	Type 'L' Copper	Wrought	Soldered

*** Refrigerant pipe cleaned and sealed for refrigerant service.

3.11 VIBRATION ISOLATION SCHEDULE

ISOLATED EQUIPMENT	ISOLATOR TYPE	MINIMUM THICKNESS
Piping - Above Ceilings	4	As Required
Piping - Equip. Rooms	1	As Required
Chillers	9	1-1/4"
Condensers	8	1/2"
Air Handlers and Fans		
Floor Mount at Grade	9	As Required
Floor Mount above Grade	3	As Required
Suspended	6	As Required
Mounted on Steel		
Platform above Ceiling	10	As Required

END OF SECTION 233000

SECTION 233700 - HVAC EQUIPMENT

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 SCOPE OF WORK

- A. This Section describes equipment for use in the Project's Mechanical Systems. Items are described which may or may not be included in this Project.
- B. Refer to the Equipment Schedules on the Drawings.
- C. Work included under this Section shall include, but not be limited to electric heaters and refrigerant specialties.

1.3 RELATED WORK

- A. This Section is to be used in conjunction with the provisions of all other Sections of Division 23, especially Section 230500 Commons Work Results for HVAC.
- B. Refer also to any applicable portions of Division 26, Electrical Work.

1.4 SUBMITTALS

- A. Provide submittals for review in accordance with the provisions of Section 230500.
- B. Submit Manufacturer's Installation Instructions under provisions of Section 230500. Include Manufacturer's wiring and piping diagrams prepared for this project.
- C. Submit samples under provisions of Section 230500.

1.5 QUALITY ASSURANCE

- A. All items provided under the provisions of this Section shall be new and shall be the products of recognized manufacturers of that item.
- B. All items of a similar class shall be the products of the same manufacturer. That is, all accessory items, etc. shall be from the same source.

1.6 REGULATORY REQUIREMENTS

- A. Comply with applicable regulations.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Protect equipment from physical damage by storing in protected areas and leaving factory covers in place.
- B. Do not operate fans for any purpose, temporary or permanent, until ductwork is clean, filters in place, bearings lubricated, and fan has been run under observation.

1.8 SEQUENCING AND SCHEDULING

- A. Sequence and schedule work to match the finishing schedule for the project.
- B. Install electric heaters in finished areas after walls and ceiling are finished and painted. Avoid damage to completed work.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The following material describes the requirements and materials for various items included in the Project's Mechanical systems.
- B. It should be noted that this particular Project may not include all of the items listed. Refer to the Schedules on the Drawings for those items specific to this Project.

2.2 REFRIGERATION SPECIALTIES

- A. Acceptable Manufacturers:
 - 1. Sporlan Valve Company
 - 2. Alco Valve Company
 - 3. Henry Valve Company
- B. Specialties provided by equipment manufacturer as a part of packaged equipment shall be used. Additional items needed shall comply with the following specification.
- C. Liquid Indicators:
 - 1. Provide combination liquid and moisture indicator.
 - 2. Double port type with copper or brass body, and flared or solder ends.

3. Provide removable seal caps on each port for inspection of refrigerant condition.
4. Provide full size liquid indicators in main liquid line leaving condenser. If receiver is used, install in liquid line leaving receiver.

D. Strainers:

1. Angle type with brass shell and replaceable cartridge.
2. Suitable for refrigerant and piping material utilized in the system.
3. Provide full size strainer ahead of each expansion or solenoid valve. Where multiple expansion valves with integral strainers are used install single main liquid line strainer.
4. On steel piping systems provide strainer in suction line to remove scale and rust.
5. Provide shut-off valve on each side of strainer to facilitate maintenance.

E. Refrigerant Driers:

1. In-line or angle type with copper or brass shell.
2. Employ replaceable desiccant drier material.
3. Provide full flow permanent refrigerant drier in low temperature systems and systems utilizing hermetic compressors.
4. Provide three-valve bypass assembly.

F. Filter-Driers:

1. Angle type, with brass shell and using combined straining and drying material.
2. Employ replaceable desiccant material.
3. Acceptable in lieu of separate strainers and driers.
4. Provide three-valve bypass assembly.

G. Solenoid Valves:

1. Copper or brass body with flared or soldered ends.
2. Use replaceable coil assembly.
3. Provide a manually operated stem to permit operation in case of coil failure on valves over 3/4 inch line size.

4. Provide solenoid valves in liquid line of system operating with single pump-out or pump-down compressor control, in each liquid circuit of evaporator systems, and in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.

H. Expansion Valves:

1. Angle type or straight through design suitable for the refrigerant utilized in the system.
2. Brass body, internal or external equalizer, and adjustable superheat setting, complete with capillary tube and remote sensing bulb. Flared, solder or flanged connections.
3. Size expansion valves to avoid being undersized at full load and excessively oversized at partial load.
4. Evaluate refrigerant pressure drop through system to determine the available pressure drop across each valve.
5. Select valves for maximum load at design operating differential pressure and minimum of 12 degrees F of Superheat.

I. Charging Valves:

1. General purpose type with brass body, flared or solder ends, cap and chain.
2. Provide valve inlet with quick SAE thread for standard manifold hose.
3. Provide refrigerant charging connections in liquid line between receiver shut-off valve and drier.

J. Flexible Connectors:

1. Close pitch corrugated bronze hose with single layer of exterior braiding.
2. At least 9 inches long with bronze fittings.
3. Utilize only at or near compressors where it is not physically possible to absorb vibration within piping configuration.

K. Refrigerant Hand Valves:

1. 7/8 inch O.D. line size and smaller: Packless type, solder or flare connections.
2. 1-1/8 inch O.D. line size and larger: Packed stem with adjustable packing nut and seal cap. Sizes 3-1/8 inch O.D. and larger, provide wing handle seal cap; solder connections.

2.3 ELECTRIC CEILING HEATERS

- A. Fan-forced CEILING electric air heater shall be U.L. Listed and field rated for 208 volts. Heating unit shall contain steel tube, brazed, spiral finned shielded element(s), a unit bearing, impedance and fuse protected motor, which is mounted on elastomeric polymer vibration isolating bushings and drive a 6.25" nylon backward curved centrifugal fan delivering 60 CFM of airflow.
- B. The heating unit shall be provided with ceiling insert for flush mounting to ceiling. Insert shall be 20 gauge steel and have four knockouts, an attached grounding wire, a junction box volume of 82 cubic inches. All fabricated metal parts shall be finished and protected by a complete powder coating method.
- C. A wall microprocessor-controlled electronic temperature/dual setback thermostat, and "On/Off" switch shall be provided. The fan motor speed and element power shall be separately controlled by the thermostat and capable of regulating temperature to within one degree F.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

- A. Install in accordance with manufacturer's printed installation instructions.
- B. Protect units with protective covers during balance of construction.

3.2 EXAMINATION

- A. Verify that surfaces are ready to receive work and opening dimensions are as instructed by the manufacturer.
- B. Verify that required utilities are available, in proper location, and ready for use.
- C. Beginning of installation means installer accepts existing surfaces.

3.3 REFRIGERATION SPECIALTIES

- A. Refrigerant Driers:
 - 1. Mount drier vertically in liquid line adjacent to receiver with bypass assembly to permit isolation of drier for servicing.
 - 2. In replacement core driers, mount with access cover pointing downward.
- B. Filter-Driers:
 - 1. Install with bypass assembly to permit isolation for servicing.
 - 2. Install with removable access cover facing downward.

C. Expansion Valves:

1. Locate expansion valve sensing bulb immediately after evaporator outlet on suction line.
2. Remove power element and cage assembly when soldering expansion valve into line.
3. Connect external equalizer line to evaporator suction outlet at top of horizontal or side of vertical suction pipe.
4. Securely clamp bulb to suction line using two mechanical clamps. Locate bulb at 7 o'clock on horizontal suction pipe.
5. Insulate suction line and bulb.

D. Flexible Connectors:

1. Install so that there is no strain placed on adjacent equipment.

E. Refrigerant Hand Valve:

1. Install solder end valves with valves fully open while applying heat.

F. Refrigerant Piping:

1. Install according to requirements of equipment manufacturer, but provide NO LESS than the following procedures.
2. Braze all joints using medium temperature brazing alloy, "Silfos" or equivalent, using an appropriate flux.
3. All tubing to be factory cleaned and capped for refrigeration use. All fittings to be long sweep, wrought copper type.
4. Perform all brazing operations while flowing an inert gas (anhydrous nitrogen) through the joint being brazed.
5. Pressure test completed piping to 400 psig on high side and to 200 psig on low side. Isolate or remove control elements or system components not rated to withstand these pressures. Pressurize piping by raising pressure to 50 psig using new, clean refrigerant, then raise level to test pressure using anhydrous nitrogen. Check each and every joint for tightness using an electronic halide leak detector set at maximum sensitivity. Repair any leaks found, repressurize and re-test until tight.
6. Remove test pressure and evacuate system to 500 microns or lower. Use minimum of 1/2 HP vacuum pump and 3/4" connection to system. After reaching 500 micron level, continue to pump for four (4) hours to evacuate residual moisture. Isolate system and remove pump. If system vacuum rises above 400 microns after four (4) hours, reconnect pump and

re-evacuate to 500 microns holding for four (4) hours. If system vacuum remains below 400 microns after four (4) hours with vacuum pump disconnected, it may be charged.

7. Remove pump, break vacuum with new, dry Refrigerant 22 gas and permit system to achieve equilibrium (probably 50 to 70 psig). Complete charging to operating level in accordance with equipment manufacturer's recommendations.
8. If outdoor temperatures are below 60F, it may be necessary to apply heat to the air cooled condenser coils to insure boil-off of residual moisture. This may be done using heat lamps, taking care to avoid overheating of coils.

END OF SECTION 233700

SECTION 15700 - VARIABLE REFRIGERANT VOLUME AIR CONDITIONING SYSTEM

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 SCOPE OF WORK

- A. Outdoor units, heat pump units & indoor units.
- B. Refrigerant system including piping & valves.
- C. Operating controls and control wiring.
- D. Refrigerant.
- E. Indoor unit condensate pump where gravity draining of condensate is not possible.
- F. Central monitoring control system.
- G. Line-set Cover System
- H. Outdoor unit support stand system.
- I. Integral condensate pumps for indoor units.

1.3 RELATED WORK

- A. Section 230500 - Common Work Results for HVAC
- C. Section.230700 - Insulation Systems.
- D. Section 230800 - Commissioning of Systems.
- E. Section 233000 - Basic Materials & Methods
- F. Section 233700 - HVAC Equipment.
- G. Section 238120 - Variable Refrigerant Flow Building Management System - Bid Alternate No. 3.
- H. All other Sections of Division 22.

I. All other Sections of Division 26.

1.4 QUALITY ASSURANCE

- A. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
- B. All wiring shall be in accordance with the National Electrical Code (NEC).
- C. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.
- D. All units must meet or exceed the 2010 Federal minimum efficiency requirements and the proposed ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the DOE alternative test procedure, which is based on the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standards 340/360, 1230 and ISO Standard 13256-1.
- E. A full charge of R-410A for the condensing unit only shall be provided in the condensing unit.
- F. The VRF system shall be installed by a licensed mechanical contractor trained by the VRF equipment manufacturer or certified manufacturer's agent.

1.5 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 230500.
- B. Submit manufacturer's installation instructions under provisions of Section 230500.
- C. Submit unit performance data including: capacity, nominal and operating performance.
- D. Submit Mechanical Specifications for unit and accessories describing construction, components and options. This shall include drawings indicating overall dimensions as well as installation, operation and services clearances. Indicate lift points and recommendations and center of gravity. Indicate unit shipping, installation and operating weights including dimensions.
- E. Submit data on electrical requirements and connection points. Include recommended wire and fuse sizes or MCA, sequence of operation, safety and start-up instructions.
- F. Prepare and submit for approval, VRF Systems Fabrication Drawings drawn to 1/4"=1'-0" or larger scale. This shall be incorporated with the Ductwork Erection Drawings and coordinated with all other trades through the procedure outlined in Specification Section 233000 - Basic Materials and Methods, 1.4 Submittals (J.). The VRF System manufacturer shall certify that the layout submitted conforms to their requirements.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit manufacturer's descriptive literature, operating instructions, and maintenance and repair data under provisions of section 230500.

1.7 STORAGE AND HANDLING

- A. All VRF equipment shall be stored protected from weather, extreme temperature, etc. as suggested by the manufacturer. All VRF equipment shall be moved, listed, etc. as suggested by the manufacturer.

1.8 WARRANTY

- A. Manufacturer warrants original owner of the non-residential building, multifamily residence or residence under normal use and maintenance for comfort cooling and conditioning applications such products (the "Products") will be free from defects in material and workmanship. This warranty applies to compressor and all parts and is limited in duration to ten (10) years starting from the "installation date" which is one of the two dates below:
 - 1. The installation date is the date that the unit is originally commissioned, but no later than 18 months after the manufacture date noted on the unit's rating plate.
 - 2. If the date the unit is originally commissioned cannot be verified, the installation date is three months after the manufacture date.

1.9 COMMISSIONING

- A. Commissioning shall be performed by the manufacturer or certified manufacturer's agent.

1.10 CONTROLS

- A. The control system shall consist of a low voltage communication network of unitary built-in controllers with on-board communications and a web-based operator interface. A web controller with a network interface card shall gather data from this system and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.
- B. System controls and control components shall be installed in accordance with the manufacturer's written installation instructions.
- C. Furnish energy conservation features such as optimal start, night setback, request-based logic, and demand level adjustment of overall system capacity as specified in the sequence.
- D. System shall provide direct and reverse-acting on and off algorithms based on an input condition or group conditions to cycle a binary output or multiple binary outputs.

- E. Provide capability for future system expansion to include monitoring and use of occupant card access, lighting control and general equipment control.
- F. System shall be capable of email generation for remote alarm annunciation.
- G. Control system start-up shall be a required service to be completed by the manufacturer or a duly authorized, competent representative that has been factory trained in Mitsubishi controls system configuration and operation. The representative shall provide proof of certification for Mitsubishi CMCN Essentials Training and/or CMCN Hands-On Training indicating successful completion of no more than two (2) years prior to system installation. This certification shall be included as part of the equipment and/or controls submittals. This service shall be equipment and system count dependent and shall be a minimum of one (1) eight (8) hour period to be completed during normal working hours.

1.11 QUALITY ASSURANCE

- A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL), in accordance with ANSI/UL 1995 - Heating and Cooling Equipment and bear the Listed Mark.
- B. All wiring shall be in accordance with the National Electric Code (NEC).
- C. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
- D. Mechanical equipment for wind-born debris regions shall be designed in accordance with ASCE 7-2010 and installed to resist the wind pressures on the equipment and the supports.
- E. The condensing unit will be factory charged with R-410A.

1.12 DELIVERY, STORAGE AND HANDLING

- A. Unit shall be stored and handled according to the manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. The variable capacity, heat recovery air conditioning system is based on products manufactured by Daikin utilizing their Variable Refrigerant Volume Series (heat and cool model) 3 pipe split system. The system shall consist of multiple evaporators, branch selector boxes, REFNET™ joints and headers, a three pipe refrigeration distribution system using PID control and Daikin VRV condenser unit. The condenser shall be a direct expansion (DX), air-cooled heat recovery, multi-zone air-conditioning system with variable speed inverter driven compressors using R-410A refrigerant. The condensing unit may

connect an indoor evaporator capacity up to 200% of the condensing unit capacity. All zones are each capable of operating separately with individual temperature control. A dedicated hot gas pipe shall be required to ensure optimum heating operation performance. Two-pipe, heat recovery systems utilizing a lower temperature mixed liquid/gas refrigerant to perform heat recovery are not acceptable due to reduced heating capabilities.

- B. Condensing units shall be interconnected to indoor unit in accordance with manufacturer's engineering data book detailing each available indoor unit. The indoor units shall be connected to the condensing unit utilizing Daikin's REFNET™ specified piping joints and headers to ensure correct refrigerant flow and balancing.
- C. Operation of the system shall permit either individual cooling or heating of each indoor unit simultaneously or all of the indoor units associated with each branch of the cool/heat selector boxes. Each indoor unit or group of indoor units shall be able to provide set temperature independently via a local remote controller, an Intelligent Controller, an Intelligent Manager or a BMS interface.
- C. Branch selector boxes shall be located as shown on the drawing. The branch selector boxes shall have the capacity to control up to 290 MBH (cooling) downstream of the branch selector box. Each branch of the branch selector box shall consist of three electronic expansion valves, refrigerant control piping and electronics to facilitate communications between the box and main processor and between the box and indoor units. The branch selector box shall control the operational mode of the subordinate indoor units. The use of three EEV's ensures continuous heating during defrost (multiple condenser systems), no heating impact during changeover and reduced sound levels. The use of solenoid valves for changeover and pressure equalization shall not be acceptable due to refrigerant noise.

2.2 Daikin VRV IV FEATURES AND BENEFITS

- A. Voltage Platform -Heat recovery condensing units shall be available with a 208-230V/3/60 power supply.
- B. Advanced Zoning - A single system shall provide for up to 64 zones.
- C. Independent Control - Each indoor unit shall use a dedicated electronic expansion valve with 2000 positions for independent control.
- D. VFD Inverter Control and Variable Refrigerant Temperature - Each condensing unit shall use high efficiency, variable speed all "inverter" compressor(s) coupled with inverter fan motors to optimize part load performance. The system capacity and refrigerant temperatures shall be modulated automatically to set suction and condensing pressures while varying the refrigerant volume for the needs of the cooling or heating loads. The control will be automatic and customizable depending on load and weather conditions. Indoor units shall use PID to control superheat to deliver a comfortable room temperature condition and optimize efficiency.

- E. Configurator software - Each system shall be available with configurator software package to allow for remote configuration of operational settings and also for assessment of operational data and error codes. If this software is not provided by an alternate manufacturer, for each individual outdoor unit the contractor shall do the settings manually and keep detailed records for future maintenance purposes.
- F. Autocharging - Each system shall have a refrigerant auto-charging function.
- G. Defrost Heating - Multiple condenser VRV systems shall maintain continuous heating during defrost operation. Reverse cycle (cooling mode) defrost operation shall not be permitted due to the potential reduction in space temperature.
- H. Oil Return Heating - Multiple condenser VRV systems shall maintain continuous heating during oil return operation. Reverse cycle (cooling mode) oil return during heating operation shall not be permitted due to the potential reduction in space temperature.
- I. Low Ambient Cooling - Each system shall be capable of low ambient cooling operation to -4°F DB.
- J. Independent Control - Each indoor unit shall use a dedicated electronic expansion valve for independent control.
- K. Flexible Design -
 - 1. Systems shall be capable of up to 540ft (623ft equivalent) of linear piping between the condensing unit and furthest located indoor unit.
 - 2. Systems shall be capable of up to 3,280ft total "one-way" piping in the piping network.
 - 3. Systems shall have a vertical (height) separation of up to 295ft between the condensing unit and the indoor units.
 - 4. Systems shall be capable of up to 295ft from the first REFNET™ / branch point.
 - 5. The condensing unit shall have the ability to connect an indoor unit evaporator capacity of up to 200% of the condensing unit capacity.
 - 6. Systems shall be capable of 98ft vertical separation between indoor units.
 - 7. Condensing units shall be supported with a fan motor ESP up to 0.32" WG as standard to allow connection of discharge ductwork and to prevent discharge air short circuiting.
 - L. Oil Return - Each system shall be furnished with a centrifugal oil separator and active oil recovery cycle
- M. Simple Wiring - Systems shall use 16/18 AWG, 2 wire, multi-stranded, non-shielded and non-polarized daisy chain control wiring.
- N. Outside Air - Systems shall provide outside air capability.
- O. Space Saving - Each system shall have a condensing unit module footprint as small as 36-5/8" x 30-1/8".

- P. Advanced Diagnostics - Systems shall include a self diagnostic, auto-check function to detect a malfunction and display the type and location.
- Q. Each condensing unit shall incorporate contacts for electrical demand shedding with optional 3 stage demand control with 12 customizable demand settings.
- R. Advanced Controls - Each system shall have at least one remote controller capable of controlling up to 16 indoor units.
- S. Each system shall be capable of integrating with open protocol BACnet and LonWorks building management systems.
- T. Low Sound Levels - Each system shall use indoor and condensing units with quiet operation as low as 27 Db(A).

2.3 ACCEPTABLE MANUFACTURER'S

- A. Equivalent Variable Refrigerant Flow Air Conditioning Systems with Heat Recovery manufactured by LG Electronic and Mitsubishi will be considered for this project.

2.4 SUBSTITUTION PROCEDURE FOR VRF SYSTEMS

- A. The alternate equipment supplier shall provide to the bidding mechanical contractor a complete equipment data package. This package shall include, but is not limited to, equipment capacities at the design condition, power requirements, indoor units CFM/static pressures, fan curves, installation requirements, and physical dimensions. Nominal performance data is not acceptable.
- B. The mechanical contractor shall request and receive the equipment data package 15 days prior to bid date and submit this package with the alternate bid.
- C. The mechanical contractor shall list the equipment supplier and submit the required data package with the bid detailing a complete comparison of the proposed alternate equipment to the specified equipment and the associated cost reduction of the alternate equipment. The contractor bids an alternate manufacturer with full knowledge that the manufacturer's product may not be acceptable or approved.
- D. All equipment must have visible and permanent label clearly identifying the original manufacturer of the equipment. These labels shall have original manufacturer's name and contact information and be located both inside and outside the equipment and on all equipment-related literature. Submittals shall include the above statement as confirmation by supplier that all conditions are agreed to and complied to. Failure to comply with these requirements shall be sufficient cause for rejection of the submittal and product with no further consideration.
- E. The alternate equipment supplier shall furnish a complete drawing package to the mechanical contractor 15 days prior to bid day for bidding and installation. The drawing

format shall be .dxf or equivalent, on 30"x42" sheets. The HVAC and electrical series design documents will be made available in electronic format for use by the equipment supplier in preparing their drawings. The alternate equipment supplier shall prepare the following drawings:

HVAC Floor Plans
HVAC Refrigerant Piping Plans
HVAC Refrigerant Piping/Controls Details
HVAC Details
HVAC Schedules

- F. The alternate equipment supplier shall draft all piping circuits, components, overall building control schematic, detailed control wiring diagrams, system details and schedules for their system. The drawings shall convey all requirements to successfully install the alternate equipment suppliers system.
- G. Provide (2) drawing package sets plotted on 20 lb. vellum. Provide (1) drawing package in electronic format (.dxf files) on CD.
- H. The submitted documents shall be complete system designs and show no less information than the HVAC equipment/controls contract bid documents.
- I. LG Electronics and Mitsubhi are considered named manufacturers equivalent to Daikin and are not alternate equipment manufacturer's.

2.5 CONDENSING UNIT

- A. General: The condensing unit is designed specifically for use with VRV IV series components.
 - 1. The condensing unit shall be factory assembled in the USA and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of Daikin inverter scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports, liquid receiver and suction accumulator. High/low pressure gas line, liquid and suction lines must be individually insulated between the condensing and indoor units.
 - 2. The condensing unit can be wired and piped with access from the left, right, rear or bottom.
 - 3. The connection ratio of indoor units to condensing unit shall be permitted up to 200%.
 - 4. Each condensing system shall be able to support the connection of up to 64 indoor units dependent on the model of the condensing unit.
 - 5. The sound pressure level standard shall be that value as listed in the Daikin engineering manual for the specified models at 3 feet from the front of the unit. The condensing unit shall be capable of operating automatically at further reduced

- noise during night time or via an external input.
6. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for reprogramming.
 7. The unit shall incorporate an auto-charging feature. Manual changing should be support with a minimum of 2 hours of system operation data to ensure correct operation.
 8. The condensing unit shall be modular in design and should allow for side-by-side installation with minimum spacing.
 9. The following safety devices shall be included on the condensing unit; high pressure sensor and switch, low pressure sensor, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
 10. To ensure the liquid refrigerant does not flash when supplying to the various indoor units, the circuit shall be provided with a sub-cooling feature.
 11. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation. Each system shall maintain continuous heating during oil return operation.
 12. The condensing unit shall be capable of heating operation at -13°F wet bulb ambient temperature without additional low ambient controls or an auxiliary heat source.
 13. The multiple condenser VRV systems shall continue to provide heat to the indoor units in heating operation while in the defrost mode.
- B. Unit Cabinet: The condensing unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.
- C. Fan: The condensing unit shall consist of one or more propeller type, direct-drive 350 or 750 W fan motors that have multiple speed operation via a DC (digitally commutating) inverter. The condensing unit fan motor shall have multiple speed operation of the DC (digitally commutating) inverter type, and be of high external static pressure and shall be factory set as standard at 0.12 in. WG. A field setting switch to a maximum 0.32 in. WG pressure is available to accommodate field applied duct for indoor mounting of condensing units. The fan shall be a vertical discharge configuration with a nominal airflow maximum range of 5,544 CFM to 24,684 CFM dependent on model specified. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted. The fan motor shall be provided with a fan guard to prevent contact with moving parts. Night setback control of the fan motor for low noise operation by way of automatically limiting the maximum speed shall be a standard feature. Operation sound level shall be selectable from 3 steps.
- D. Condenser Coil: The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically

bonded on to aluminum fins to an e-Pass Design. The fins are to be covered with an anti-corrosion Ultra Gold coating as standard with a salt spray test rating of 1000hr (ASTM B117 & Blister Rating:10), Acetic acid salt spray test: 500hr (ASTM G85 & Blister Rating:10) The pipe plates shall be treated with powdered polyester resin for corrosion prevention. The thickness of the coating must be between 2.0 to 3.0 microns. The outdoor coil shall have three-circuit heat exchanger design eliminating the need for bottom plate heater. The lower part of the coil shall be used for inverter cooling and be on or off during heating operation enhancing the defrost operation. The condensing unit shall be factory equipped with condenser coil guards on all sides.

E. Compressor:

1. Inverter scroll compressors shall be variable speed (PVM inverter) controlled which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency) shall be controlled to eliminate deviation from target value. Non inverter-driven compressors, which may cause starting motor current to exceed the nominal motor current (RLA) and require larger wire sizing, shall not be allowed.
2. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll "G-type" or "J-type".
3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
4. The capacity control range shall be as low as 3% to 100%.
5. The compressors' motors shall have a cooling system using discharge gas, to avoid sudden changes in temperature resulting in significant stresses on winding and bearings.
6. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
7. Oil separators shall be standard with the equipment together with an intelligent oil management system.
8. The compressor shall be spring mounted to avoid the transmission of vibration eliminating the standard need for spring insulation.
9. In the event of compressor failure the remaining compressors shall continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be designed to specifically address this condition.
10. In the case of multiple condenser modules, conjoined operation hours of the compressors shall be balanced by means of the Duty Cycling Function, ensuring sequential starting of each module at each start/stop cycle, completion of oil

return, completion of defrost or every 8 hours and extending the operating life of the system. When connected to a central control system, sequential start is activated for all system on each DIII network.

F. Electrical:

1. The power supply to the condensing unit shall be 208-230 volts, 3 phase, 60 hertz +/- 10%.

Power Supply Voltage	Voltage Range
208-230V/3/60	187V-253V

2. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded, stranded 2 conductor cable.
3. The control wiring shall be a two-wire multiplex transmission system, making it possible to connect multiple indoor units to one condensing unit with one 2-cable wire, thus simplifying the wiring installation. Wire Type 16/18 AWG, 2 wire, non-polarity, non-shielded, stranded

2.6 BRANCH SELECTOR BOX FOR VRF HEAT RECOVERY SYSTEM

A. General: The branch selector boxes are designed specifically for use with VRV IV series heat recovery system components.

1. The selector boxes shall be factory assembled, wired, and piped.
2. The branch controllers must be run tested at the factory.
3. The selector boxes must be mounted indoors.
4. When simultaneously heating and cooling, the units in heating mode shall energize their subcooling electronic expansion valve.

B. Unit Cabinet:

1. The units shall have a galvanized steel plate casing.
2. Each cabinet shall house 3 electronic expansion valves for refrigerant control per branch.
3. The cabinet shall contain one subcooling heat exchanger per branch.
4. The unit shall have sound absorption thermal insulation material made of flame and heat resistant foamed polyethylene.
5. Nominal sound pressure levels must be measured and published on the submittals by the manufacturer.
6. If an alternate manufacturer is selected, the mechanical contractor shall provide, at their own cost and expense, any additional material and labor to meet the published sound levels above.

C. Dimensions:

1. Each unit shall be no larger than 8-1/8" x 15-1/4" x 12-13/16".D.

D. Refrigerant Valves:

1. The unit shall be furnished with 3 electronic expansion valves per branch to control the direction of refrigerant flow. The use of solenoid valves for changeover and pressure equalization shall not be acceptable due to refrigerant noise.
2. The refrigerant connections must be of the braze type.
3. In multi-port units, each port shall have its own electronic expansion valves. If common expansion/solenoid valves are used, redundancy must be provided.
4. Each circuit shall have at least one (36,000 Btu/h indoor unit or smaller for the BSQ36TVJ, 54,000 Btu/h indoor unit or smaller for the BS(4/6/8/10/12)Q54TVJ, 60,000 Btu/h indoor unit or smaller for the BSQ60TVJ and 96,000 Btu/h indoor unit or smaller for the BSQ96TVJ) branch selector box.
5. Multiple indoor units may be connected to a branch selector box with the use of a REFNET™ joint provided they are within the capacity range of the branch selector.

E. Condensate Removal:

1. The unit shall not require provisions for condensate removal. A safety device or secondary drain pan shall be installed by the mechanical contractor to comply with the applicable mechanical code, if an alternate manufacturer is selected.

F. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.
2. The unit shall be capable of operation within the limits of 187 volts to 255 volts.
3. The minimum circuit amps (MCA) shall be 0.1 and the maximum overcurrent protection amps (MOP) shall be 15.
4. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded 2 conductor cable.

2.7 CONTROLS

- A. HR unit(s) shall have factory installed unit mounted control boards and integral microprocessor to communicate with indoor units and outdoor units over a single stranded, shielded, twisted wire pair.
- B. Manufacturer shall provide screw terminal connections at the HR unit to terminate power wiring and communications cables.

2.8 WALL MOUNTED - STANDARD

- A. Unit shall be manufactured by LG. Unit shall be factory assembled, wired, piped and run tested. Unit shall be designed to be installed for indoor application. Unit shall be attached to an installation plate/bracket that secures unit to the wall. Unit shall be capable to be installed with heat pump or heat recovery or cooling VRF system. The depth of the unit shall not exceed 10 inches.

- B. Unit case shall be manufactured using Acrylonitrile Butadiene Styrene (ABS) polymeric resin and has a morning fog finish.
- C. Unit shall have one supply air outlet and one return air inlet. Unit shall be equipped with factory installed temperature thermistors for:
 - a. Return air
 - b. Refrigerant entering coil
 - c. Refrigerant leaving coil
- D. Unit shall have a factory assembled, piped and wired electronic expansion valve (EEV) for refrigerant control.
- E. Unit shall have a built-in control panel to communicate with other indoor units and to the outdoor unit.
- F. Unit shall have the following functions as standard:
 - a. Self-diagnostic function
 - b. Auto addressing
 - c. Auto restart function
 - d. Auto changeover function (Heat Recovery system only)
 - e. Auto operation function
 - f. Auto clean function
 - g. Child lock function
 - h. Forced operation
 - i. Dual thermistor control
 - j. Sleep mode
 - k. Dual setpoint control
 - l. Filter life and power consumption display
- G. Unit shall be capable of refrigerant piping in 4 different directions.
- H. Unit shall be capable of drain piping in 2 different directions.
- I. Fan Assembly: The unit shall have a single, direct driven, crossflow tangential Sirocco fan made of high strength ABS BSN-7530 polymeric resin. The fan impeller shall be statically and dynamically balanced. The fan motor is Brushless Digitally controlled (BLDC) with permanently lubricated and sealed ball bearings. The fan motor shall include thermal, overcurrent and low RPM protection. The fan/motor assembly shall be mounted on vibration attenuating rubber grommets. The fan speed shall be controlled using microprocessor based direct digitally controlled algorithm. In cooling mode, the indoor fan shall have the following settings: Low, Med, High, Power Cool, and Auto. In heating mode, the indoor fan shall have the following settings: Low, Med, High, and Auto. Unit shall have factory installed motorized louver to provide flow of air in up and down direction for uniform airflow. Unit shall have factory installed motorized guide vane to control the direction of flow of air from side to side.
- J. Filter Assembly: The return air inlet shall have a factory supplied removable, washable filter

with antifungal treatment. The unit shall have the option for a secondary plasma filter accessory. The filter access shall be from the front of the unit.

- K. Coil Assembly: Unit shall have a factory built coil comprised of aluminum fins mechanically bonded on copper tubing. The copper tubing shall have inner grooves for high efficiency heat exchanger. Unit shall have a minimum 2 row coil, 18 fins per inch. Unit shall have a factory supplied condensate drain pan below the coil constructed of EPS (expandable polystyrene resin). Unit shall be designed for gravity drain. Unit shall have a factory insulated drain hose to handle condensate. Unit shall have provision of 45° flare refrigerant pipe connections. The coil shall be factory pressure tested at a minimum of 551 psig.
- L. All refrigerant piping from outdoor unit to indoor unit shall be field insulated.
- M. Microprocessor Control: The unit shall have a factory installed microprocessor controller capable of performing functions necessary to operate the system. The unit shall be able to communicate with other indoor units and the outdoor unit using a field supplied minimum of 18 AWG, 2 core, stranded and shielded communication cable. The unit controls shall operate the indoor unit using one of the five operating modes:
 - a. Auto changeover (Heat Recovery System only)
 - b. Heating
 - c. Cooling
 - d. Dry
 - e. Fan only
- N. Electrical: The unit electrical power shall be 208-230/1/60 (V/Ph/Hz) The unit shall be capable of operating within voltage limits of +/- 10% of the rated voltage.
- O. Controls: Unit shall use controls provided by the manufacturer to perform all functions necessary to operate the system effectively and efficiently and communicate with the outdoor unit over an RS485 daisy chain.

2.9 CEILING CASSETTE - 4 WAY

- A. Unit shall be factory assembled, wired, piped and run tested. Unit shall be designed to be installed for indoor application. Unit shall be designed to mount recessed in the ceiling and has a surface mounted grille on the bottom of the unit. The unit shall be available in both 2' x 2' and 3' x 3' chassis. Unit shall be capable to be installed with heat pump or heat recovery or cooling VRF system.
- B. Unit case shall be manufactured using galvanized steel plate. The unit shall be provided with an off-white Acrylonitrile Butadiene Styrene (ABS) polymeric resin architectural grille. The grille shall have a tapered trim edge, and a hinged, spring clip (screw-less) return air filter-grille door. Unit shall be provided with metal ears designed to support the unit weight on four corners. Ears shall have pre-punched holes designed to accept field supplied all thread rod hangers.
- C. Cabinet Assembly: Unit shall have four supply air outlets and one return air inlet. The

supply air outlet shall be through four-directional slot diffuser each equipped with independent oscillating motorized guide vane designed to change the airflow direction. The grille shall have a discharge range of motion of 40° in an up/down direction with capabilities of locking the vanes. The unit shall have a guide vane algorithm designed to sequentially change the predominant discharge airflow direction in counterclockwise pattern. Guide vanes shall provide airflow in all directions. Unit shall be equipped with factory installed temperature thermistors for:

- a. Return air
 - b. Refrigerant entering coil
 - c. Refrigerant leaving coil
- D. Unit shall have a factory assembled, piped and wired electronic expansion valve (EEV) for refrigerant control.
- E. Unit shall have a built-in control panel to communicate with other indoor units and to the outdoor unit.
- F. The unit shall have factory designated branch duct knockouts on the unit case.
- G. The unit shall have provision of fresh air ventilation through a knock-out on the cabinet.
- H. The branch duct knockouts shall have the ability to duct up to ½ the unit airflow capacity.
- I. The branch duct cannot be ducted to another room.
- J. Unit shall have the following functions as standard:
- a. Self-diagnostic function
 - b. Auto addressing
 - c. Auto restart function
 - d. Auto changeover function (Heat Recovery system only)
 - e. Auto operation function
 - f. Child lock function
 - g. Forced operation
 - h. Dual thermistor control
 - i. Sleep mode
 - j. Dual setpoint control
 - k. Multiple aux heater applications
 - l. Filter life and power consumption display
- K.. Fan Assembly: The unit shall have a single, direct drive, turbo fan made of high strength ABS HT-700 polymeric resin. The fan impeller shall be statically and dynamically balanced. The fan motor is Brushless Digitally controlled (BLDC) with permanently lubricated and sealed ball bearings. The fan motor shall include thermal, overcurrent and low RPM protection. The fan/motor assembly shall be mounted on vibration attenuating rubber grommets. The fan speed shall be controlled using microprocessor based direct digitally controlled algorithm. In cooling mode, the indoor fan shall have the following settings: Low, Med, High, Power Cool, and Auto. In heating mode, the indoor fan shall have the

following settings: Low, Med, High, and Auto. Unit shall have factory installed motorized louver to provide flow of air in up and down direction for uniform airflow.

- L. Filter Assembly: The return air inlet shall have a factory supplied removable, washable filter with antifungal treatment. The unit shall have the option for a secondary plasma filter accessory. The filter access shall be from the bottom of the unit. The unit shall have provision for an optional auto-elevating grille kit designed to provide motorized ascent/descent of the return air grille/pre filter assembly.
 - a. The ascent/descent of the return air grille shall be up to a distance of 14-3/4 feet allowing access to remove and clean the filter.
 - b. The auto-elevating grille shall have a control algorithm to accept up, down and stop control commands from the controller.
 - c. The auto-elevating grille shall have a control to stop the descent automatically if a contact is made with any obstacle.

- M. Coil Assembly: Unit shall have a factory built coil comprised of aluminum fins mechanically bonded on copper tubing. The copper tubing shall have inner grooves for high efficiency heat exchanger. Unit shall have a minimum 1 or 2 row coil, 18-19 fins per inch. Unit shall have a factory supplied condensate drain pan below the coil constructed of EPS (expandable polystyrene resin). Unit shall include an installed and wired condensate drain pump capable of providing minimum 27.5 inch lift from bottom surface of the unit. The drain pump shall have a safety switch to shut off the unit if condensate rises too high in the drain pan. Unit shall have provision of 45° flare refrigerant pipe connections. The coil shall be factory pressure tested at a minimum of 551 psig. All refrigerant piping from outdoor unit to indoor unit shall be field insulated.

- N. Microprocessor Control: The unit shall have a factory installed microprocessor controller capable of performing functions necessary to operate the system. The unit shall be able to communicate with other indoor units and the outdoor unit using a field supplied minimum of 18 AWG, 2 core, stranded and shielded communication cable. The unit controls shall operate the indoor unit using one of the five operating modes: Auto changeover (Heat Recovery System only)
 - a. Heating
 - b. Cooling
 - c. Dry
 - d. Fan only

- O. Electrical: The unit electrical power shall be 208-230/1/60 (V/Ph/Hz) The unit shall be capable of operating within voltage limits of +/- 10% of the rated voltage.

- P. Controls: Unit shall use controls provided by the manufacturer to perform all functions necessary to operate the system effectively and efficiently and communicate with the outdoor unit over an RS485 daisy chain.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The VRF system shall be installed in accordance with the manufacturer's printed installation instructions.
- B. All system components shall be furnished by the system manufacturer.
- C. Coordinate the exact location of thermostats and sensor in the field with the Architect.
- D. Refrigerant piping line sets layouts indicated on the Drawings is schematic and the installation shall be arranged to conform to the VRF manufacturer's requirements.

3.2 LOCATION

- A. Locate indoor and outdoor units as indicated on drawings. Provide service clearance per manufacturer's installation manual. Adjust and level outdoor units on support structure.
- B. For climates that experience snowfall, mount the outdoor unit a minimum of 12" above the average snowfall line. In climates where this height requirement proves unfeasible, the outdoor units may be installed at the average snowfall line provided regular snow removal in the area surrounding the units keeps the snow line below the bottom of the units.

3.3 COMPONENT PIPING

- A. Installing contractor shall provide and install all accessories and piping for a fully operational system. Refer to manufacturer's installation manual for full instructions.
- B. Traps, filter driers, and sight glasses are NOT to be installed on the refrigerant piping or condensate lines.
- C. Standard ACR fittings rated for use with R410A are to be used for all connections. Proprietary manufacturer-specific appurtenances are not allowed.
- D. Refrigerant pipe for CITY MULTI shall be made of phosphorus deoxidized copper, and has two types. ACR Type-L "Annealed Temper": Soft copper pipe, can be easily bent with human's hand. ACR Type L "Drawn Temper": Hard copper pipe (Straight pipe), being stronger than Type-O pipe of the same radical thickness.
- E. The maximum operation pressure of R410A air conditioner is 4.30 MPa [623psi] . The refrigerant piping should ensure the safety under the maximum operation pressure. Refer to recommend piping specifications in Mitsubishi Electric's engineering manual. Pipes of radical thickness 0.7mm or less shall not be used.
- F. Flare connection should follow dimensions provided in manufacturer's installation

manuals.

3.4 INSULATION

- A. Refrigerant lines, as well as any valves, shall be insulated end to end with ½" closed-cell pipe insulation. If state or local codes require insulation other than that specified above, the greater insulation shall be used.

3.5 ELECTRICAL CONNECTIONS

- A. Division 16 shall provide all power 110 volts or greater. Control wiring and devices, shall be furnished and installed by this Division.
- B. Provide interconnecting connections and wiring between condensate pumps secondary float switch contacts and indoor heat pump unit condensate control wiring. Refer to the Plumbing Drawings for secondary pump locations and heat pump units to be interfaced with.

END OF SECTION 238100

SECTION 15700 - VARIABLE REFRIGERANT VOLUME AIR CONDITIONING SYSTEM

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 GENERAL PROVISIONS

- A. All of the contract documents, including General conditions, Modifications, and Division 1 General requirements, apply to the work of this section.
- B. Examine all drawings and other sections of the specification per requirements herein affecting the work of this section whether or not such work is specifically mentioned in the section.
- C. This section contains information that applies to all work performed under the contract and is hereby made a part of each specification section.
- D. The Mechanical Contractor shall examine all drawings and other sections of the specifications for requirements therein that affect the work of this section whether or not such work is specifically mentioned in this section.
- E. This section contains information that applies to all work performed under the contract and is hereby made a part of each specification section.
- F. Contractor's duties for work specified below shall include compliance with all the latest State, Local and National Codes, Ordinances, Rules, Regulations, Orders and all other requirements of Authorities, which bear on performance of work.

1.3 SCOPE OF WORK

- A. Outdoor units, heat pump units & indoor units.
- B. Refrigerant system including piping & valves.
- C. Operating controls and control wiring.
- D. Refrigerant.
- E. Indoor unit condensate pump where gravity draining of condensate is not possible.
- F. Central monitoring control system.
- G. Line-set Cover System
- H. Outdoor unit roof support stand system.

I. Ventilation Kits for Cassette Indoor Units.

1.4 RELATED WORK

A. Section 230500 - Common Work Results for HVAC

C. Section .230700 - Insulation Systems.

D. Section 230800 - Commissioning of Systems.

E. Section 233000 - Basic Materials & Methods

F. Section 233700 - HVAC Equipment.

G. Section 238120 - Variable Refrigerant Flow Building Management System - Bid Alternate No. 3.

H. All other Sections of Division 22.

I. All other Sections of Division 26.

1.5 QUALITY ASSURANCE

A. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

B. All wiring shall be in accordance with the National Electrical Code (NEC).

C. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.

D. All units must meet or exceed the 2010 Federal minimum efficiency requirements and the proposed ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the DOE alternative test procedure, which is based on the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standards 340/360, 1230 and ISO Standard 13256-1.

E. A full charge of R-410A for the condensing unit only shall be provided in the condensing unit.

F. The VRF system shall be installed by a licensed mechanical contractor trained by the VRF equipment manufacturer or certified manufacturer's agent.

1.6 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 230500.

- B. Submit manufacturer's installation instructions under provisions of Section 230500.
- C. Submit unit performance data including: capacity, nominal and operating performance.
- D. Submit Mechanical Specifications for unit and accessories describing construction, components and options. This shall include drawings indicating overall dimensions as well as installation, operation and services clearances. Indicate lift points and recommendations and center of gravity. Indicate unit shipping, installation and operating weights including dimensions.
- E. Submit data on electrical requirements and connection points. Include recommended wire and fuse sizes or MCA, sequence of operation, safety and start-up instructions.
- F. Prepare and submit for approval, VRF Systems Fabrication Drawings drawn to 1/4"=1'-0" or larger scale. This shall be incorporated with the Ductwork Erection Drawings and coordinated with all other trades through the procedure outlined in Specification Section 233000 - Basic Materials and Methods, 1.4 Submittals (J.). The VRF System manufacturer shall certify that the layout submitted conforms to their requirements.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit manufacturer's descriptive literature, operating instructions, and maintenance and repair data under provisions of section 15010.

1.7 STORAGE AND HANDLING

- A. All VRF equipment shall be stored protected from weather, extreme temperature, etc. as suggested by the manufacturer. All VRF equipment shall be moved, listed, etc. as suggested by the manufacturer.

1.8 WARRANTY

- A. Manufacturer warrants original owner of the non-residential building, multifamily residence or residence under normal use and maintenance for comfort cooling and conditioning applications such products (the "Products") will be free from defects in material and workmanship. This warranty applies to compressor and all parts and is limited in duration to ten (10) years starting from the "installation date" which is one of the two dates below:
 1. The installation date is the date that the unit is originally commissioned, but no later than 18 months after the manufacture date noted on the unit's rating plate.
 2. If the date the unit is originally commissioned cannot be verified, the installation date is three months after the manufacture date.

1.9 COMMISSIONING

- A. Commissioning shall be performed by the manufacturer or certified manufacturer's agent.

1.10 CONTROLS

- A. The control system shall consist of a low voltage communication network of unitary built-in controllers with on-board communications and a web-based operator interface. A web controller with a network interface card shall gather data from this system and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.
- B. System controls and control components shall be installed in accordance with the manufacturer's written installation instructions.
- C. Furnish energy conservation features such as optimal start, night setback, request-based logic, and demand level adjustment of overall system capacity as specified in the sequence.
- D. System shall provide direct and reverse-acting on and off algorithms based on an input condition or group conditions to cycle a binary output or multiple binary outputs.
- E. Provide capability for future system expansion to include monitoring and use of occupant card access, lighting control and general equipment control.
- F. System shall be capable of email generation for remote alarm annunciation.
- G. Control system start-up shall be a required service to be completed by the manufacturer or a duly authorized, competent representative that has been factory trained in Mitsubishi controls system configuration and operation. The representative shall provide proof of certification for Mitsubishi CMCN Essentials Training and/or CMCN Hands-On Training indicating successful completion of no more than two (2) years prior to system installation. This certification shall be included as part of the equipment and/or controls submittals. This service shall be equipment and system count dependent and shall be a minimum of one (1) eight (8) hour period to be completed during normal working hours.

1.10 QUALITY ASSURANCE

- A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL), in accordance with ANSI/UL 1995 - Heating and Cooling Equipment and bear the Listed Mark.
- B. All wiring shall be in accordance with the National Electric Code (NEC).
- C. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
- D. Mechanical equipment for wind-born debris regions shall be designed in accordance with ASCE 7-2010 and installed to resist the wind pressures on the equipment and the supports.

- E. The condensing unit will be factory charged with R-410A.

1.11 DELIVERY, STORAGE AND HANDLING

- A. Unit shall be stored and handled according to the manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. The variable capacity, heat recovery air conditioning system is based on products manufactured by Daikin utilizing their Variable Refrigerant Volume Series (heat and cool model) 3 pipe split system. The system shall consist of multiple evaporators, branch selector boxes, REFNET™ joints and headers, a three pipe refrigeration distribution system using PID control and Daikin VRV condenser unit. The condenser shall be a direct expansion (DX), air-cooled heat recovery, multi-zone air-conditioning system with variable speed inverter driven compressors using R-410A refrigerant. The condensing unit may connect an indoor evaporator capacity up to 200% of the condensing unit capacity. All zones are each capable of operating separately with individual temperature control. A dedicated hot gas pipe shall be required to ensure optimum heating operation performance. Two-pipe, heat recovery systems utilizing a lower temperature mixed liquid/gas refrigerant to perform heat recovery are not acceptable due to reduced heating capabilities.
- B. Condensing units shall be interconnected to indoor unit in accordance with manufacturer's engineering data book detailing each available indoor unit. The indoor units shall be connected to the condensing unit utilizing Daikin's REFNET™ specified piping joints and headers to ensure correct refrigerant flow and balancing.
- C. Operation of the system shall permit either individual cooling or heating of each indoor unit simultaneously or all of the indoor units associated with each branch of the cool/heat selector boxes. Each indoor unit or group of indoor units shall be able to provide set temperature independently via a local remote controller, an Intelligent Controller, an Intelligent Manager or a BMS interface.
- C. Branch selector boxes shall be located as shown on the drawing. The branch selector boxes shall have the capacity to control up to 290 MBH (cooling) downstream of the branch selector box. Each branch of the branch selector box shall consist of three electronic expansion valves, refrigerant control piping and electronics to facilitate communications between the box and main processor and between the box and indoor units. The branch selector box shall control the operational mode of the subordinate indoor units. The use of three EEV's ensures continuous heating during defrost (multiple condenser systems), no heating impact during changeover and reduced sound levels. The use of solenoid valves for changeover and pressure equalization shall not be acceptable due to refrigerant noise.

2.2 VRV IV FEATURES AND BENEFITS

- A. Voltage Platform -Heat recovery condensing units shall be available with a 208-230V/3/60 power supply.
- B. Advanced Zoning - A single system shall provide for up to 64 zones.
- C. Independent Control - Each indoor unit shall use a dedicated electronic expansion valve with 2000 positions for independent control.
- D. VFD Inverter Control and Variable Refrigerant Temperature - Each condensing unit shall use high efficiency, variable speed all "inverter" compressor(s) coupled with inverter fan motors to optimize part load performance. The system capacity and refrigerant temperatures shall be modulated automatically to set suction and condensing pressures while varying the refrigerant volume for the needs of the cooling or heating loads. The control will be automatic and customizable depending on load and weather conditions. Indoor units shall use PID to control superheat to deliver a comfortable room temperature condition and optimize efficiency.
- E. Configurator software - Each system shall be available with configurator software package to allow for remote configuration of operational settings and also for assessment of operational data and error codes. If this software is not provided by an alternate manufacturer, for each individual outdoor unit the contractor shall do the settings manually and keep detailed records for future maintenance purposes.
- F. Autocharging - Each system shall have a refrigerant auto-charging function.
- G. Defrost Heating - Multiple condenser VRV systems shall maintain continuous heating during defrost operation. Reverse cycle (cooling mode) defrost operation shall not be permitted due to the potential reduction in space temperature.
- H. Oil Return Heating - Multiple condenser VRV systems shall maintain continuous heating during oil return operation. Reverse cycle (cooling mode) oil return during heating operation shall not be permitted due to the potential reduction in space temperature.
- I. Low Ambient Cooling - Each system shall be capable of low ambient cooling operation to -4°F DB.
- J. Independent Control - Each indoor unit shall use a dedicated electronic expansion valve for independent control.
- K. Flexible Design -
 - 1. Systems shall be capable of up to 540ft (623ft equivalent) of linear piping between the condensing unit and furthest located indoor unit.
 - 2. Systems shall be capable of up to 3,280ft total "one-way" piping in the piping network.

3. Systems shall have a vertical (height) separation of up to 295ft between the condensing unit and the indoor units.
 4. Systems shall be capable of up to 295ft from the first REFNET™ / branch point.
 5. The condensing unit shall have the ability to connect an indoor unit evaporator capacity of up to 200% of the condensing unit capacity.
 6. Systems shall be capable of 98ft vertical separation between indoor units.
 7. Condensing units shall be supported with a fan motor ESP up to 0.32". WG as standard to allow connection of discharge ductwork and to prevent discharge air short circuiting.
- L. Oil Return - Each system shall be furnished with a centrifugal oil separator and active oil recovery cycle
- M. Simple Wiring - Systems shall use 16/18 AWG, 2 wire, multi-stranded, non-shielded and non-polarized daisy chain control wiring.
- N. Outside Air - Systems shall provide outside air capability.
- O. Space Saving - Each system shall have a condensing unit module footprint as small as 36-5/8" x 30-1/8".
- P. Advanced Diagnostics - Systems shall include a self diagnostic, auto-check function to detect a malfunction and display the type and location.
- Q. Each condensing unit shall incorporate contacts for electrical demand shedding with optional 3 stage demand control with 12 customizable demand settings.
- R. Advanced Controls - Each system shall have at least one remote controller capable of controlling up to 16 indoor units.
- S. Each system shall be capable of integrating with open protocol BACnet and LonWorks building management systems.
- T. Low Sound Levels - Each system shall use indoor and condensing units with quiet operation as low as 27 dB(A).

2.3 CONDENSING UNIT

- A. General: The condensing unit is designed specifically for use with VRV IV series components.
1. The condensing unit shall be factory assembled in the USA and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of Daikin inverter scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports, liquid receiver and suction accumulator. igh/low pressure gas line, liquid and suction lines must be individually insulated between the condensing and indoor

- units.
2. The condensing unit can be wired and piped with access from the left, right, rear or bottom.
 3. The connection ratio of indoor units to condensing unit shall be permitted up to 200%.
 4. Each condensing system shall be able to support the connection of up to 64 indoor units dependent on the model of the condensing unit.
 5. The sound pressure level standard shall be that value as listed in the Daikin engineering manual for the specified models at 3 feet from the front of the unit. The condensing unit shall be capable of operating automatically at further reduced noise during night time or via an external input.
 6. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for reprogramming.
 7. The unit shall incorporate an auto-charging feature. Manual changing should be supported with a minimum of 2 hours of system operation data to ensure correct operation.
 8. The condensing unit shall be modular in design and should allow for side-by-side installation with minimum spacing.
 9. The following safety devices shall be included on the condensing unit; high pressure sensor and switch, low pressure sensor, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
 10. To ensure the liquid refrigerant does not flash when supplying to the various indoor units, the circuit shall be provided with a sub-cooling feature.
 11. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation. Each system shall maintain continuous heating during oil return operation.
 12. The condensing unit shall be capable of heating operation at -13°F wet bulb ambient temperature without additional low ambient controls or an auxiliary heat source.
 13. The multiple condenser VRV systems shall continue to provide heat to the indoor units in heating operation while in the defrost mode.
- B. Unit Cabinet: The condensing unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.
- C. Fan: The condensing unit shall consist of one or more propeller type, direct-drive 350 or 750 W fan motors that have multiple speed operation via a DC (digitally commutating) inverter. The condensing unit fan motor shall have multiple speed operation of the DC (digitally commutating) inverter type, and be of high external static pressure and shall be factory set as standard at 0.12 in. WG. A field setting switch to a maximum 0.32 in. WG pressure is available to accommodate field applied duct for indoor mounting of condensing units. The fan shall be a vertical discharge configuration with a nominal airflow maximum range of 5,544 CFM to 24,684 CFM dependent on model specified. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted. The fan

motor shall be provided with a fan guard to prevent contact with moving parts. Night setback control of the fan motor for low noise operation by way of automatically limiting the maximum speed shall be a standard feature. Operation sound level shall be selectable from 3 steps.

D. Condenser Coil: The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design. The fins are to be covered with an anti-corrosion Ultra Gold coating as standard with a salt spray test rating of 1000hr (ASTM B117 & Blister Rating:10), Acetic acid salt spray test: 500hr (ASTM G85 & Blister Rating:10) The pipe plates shall be treated with powdered polyester resin for corrosion prevention. The thickness of the coating must be between 2.0 to 3.0 microns. The outdoor coil shall have three-circuit heat exchanger design eliminating the need for bottom plate heater. The lower part of the coil shall be used for inverter cooling and be on or off during heating operation enhancing the defrost operation. The condensing unit shall be factory equipped with condenser coil guards on all sides.

E. Compressor:

1. Inverter scroll compressors shall be variable speed (PVM inverter) controlled which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency) shall be controlled to eliminate deviation from target value. Non inverter-driven compressors, which may cause starting motor current to exceed the nominal motor current (RLA) and require larger wire sizing, shall not be allowed.
2. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll "G-type" or "J-type".
3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
4. The capacity control range shall be as low as 3% to 100%.
5. The compressors' motors shall have a cooling system using discharge gas, to avoid sudden changes in temperature resulting in significant stresses on winding and bearings.
6. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
7. Oil separators shall be standard with the equipment together with an intelligent

- oil management system.
8. The compressor shall be spring mounted to avoid the transmission of vibration eliminating the standard need for spring insulation.
 9. In the event of compressor failure the remaining compressors shall continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be designed to specifically address this condition.
 10. In the case of multiple condenser modules, conjoined operation hours of the compressors shall be balanced by means of the Duty Cycling Function, ensuring sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours and extending the operating life of the system. When connected to a central control system, sequential start is activated for all system on each DIII network.

F. Electrical:

1. The power supply to the condensing unit shall be 208-230 volts, 3 phase, 60 hertz +/- 10%.

Power Supply Voltage	Voltage Range
208-230V/3/60	187V-253V

2. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded, stranded 2 conductor cable.
3. The control wiring shall be a two-wire multiplex transmission system, making it possible to connect multiple indoor units to one condensing unit with one 2-cable wire, thus simplifying the wiring installation. Wire Type 16/18 AWG, 2 wire, non-polarity, non-shielded, stranded

2.4 BRANCH SELECTOR BOX FOR VRV HEAT RECOVERY SYSTEM

A. General: The branch selector boxes are designed specifically for use with VRV IV series heat recovery system components.

1. The selector boxes shall be factory assembled, wired, and piped.
2. The branch controllers must be run tested at the factory.
3. The selector boxes must be mounted indoors.
4. When simultaneously heating and cooling, the units in heating mode shall energize their subcooling electronic expansion valve.

B. Unit Cabinet:

1. The units shall have a galvanized steel plate casing.
2. Each cabinet shall house 3 electronic expansion valves for refrigerant control per branch.
3. The cabinet shall contain one subcooling heat exchanger per branch.
4. The unit shall have sound absorption thermal insulation material made of flame

and heat resistant foamed polyethylene.

5. Nominal sound pressure levels must be measured and published on the submittals by the manufacturer.
6. If an alternate manufacturer is selected, the mechanical contractor shall provide, at their own cost and expense, any additional material and labor to meet the published sound levels above.

C. Dimensions:

1. Each unit shall be no larger than 8-1/8" x 15-1/4" x 12-13/16".D.

D. Refrigerant Valves:

1. The unit shall be furnished with 3 electronic expansion valves per branch to control the direction of refrigerant flow. The use of solenoid valves for changeover and pressure equalization shall not be acceptable due to refrigerant noise.
2. The refrigerant connections must be of the braze type.
3. In multi-port units, each port shall have its own electronic expansion valves. If common expansion/solenoid valves are used, redundancy must be provided.
4. Each circuit shall have at least one (36,000 Btu/h indoor unit or smaller for the BSQ36TVJ, 54,000 Btu/h indoor unit or smaller for the BS(4/6/8/10/12)Q54TVJ, 60,000 Btu/h indoor unit or smaller for the BSQ60TVJ and 96,000 Btu/h indoor unit or smaller for the BSQ96TVJ) branch selector box.
5. Multiple indoor units may be connected to a branch selector box with the use of a REFNET™ joint provided they are within the capacity range of the branch selector.

E. Condensate Removal:

1. The unit shall not require provisions for condensate removal. A safety device or secondary drain pan shall be installed by the mechanical contractor to comply with the applicable mechanical code, if an alternate manufacturer is selected.

F. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.
2. The unit shall be capable of operation within the limits of 187 volts to 255 volts.
3. The minimum circuit amps (MCA) shall be 0.1 and the maximum overcurrent protection amps (MOP) shall be 15.
4. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded 2 conductor cable.

2.5 CONTROLS

- A. HR unit(s) shall have factory installed unit mounted control boards and integral microprocessor to communicate with indoor units and outdoor units over a single stranded, shielded, twisted wire pair.

- B. Manufacturer shall provide screw terminal connections at the HR unit to terminate power wiring and communications cables.

2.6 WALL MOUNTED - STANDARD

- A. Unit shall be manufactured by LG. Unit shall be factory assembled, wired, piped and run tested. Unit shall be designed to be installed for indoor application. Unit shall be attached to an installation plate/bracket that secures unit to the wall. Unit shall be capable to be installed with heat pump or heat recovery or cooling VRF system. The depth of the unit shall not exceed 10 inches.
- B. Unit case shall be manufactured using Acrylonitrile Butadiene Styrene (ABS) polymeric resin and has a morning fog finish.
- C. Unit shall have one supply air outlet and one return air inlet. Unit shall be equipped with factory installed temperature thermistors for:
 - a. Return air
 - b. Refrigerant entering coil
 - c. Refrigerant leaving coil
- D. Unit shall have a factory assembled, piped and wired electronic expansion valve (EEV) for refrigerant control.
- E. Unit shall have a built-in control panel to communicate with other indoor units and to the outdoor unit.
- F. Unit shall have the following functions as standard:
 - a. Self-diagnostic function
 - b. Auto addressing
 - c. Auto restart function
 - d. Auto changeover function (Heat Recovery system only)
 - e. Auto operation function
 - f. Auto clean function
 - g. Child lock function
 - h. Forced operation
 - i. Dual thermistor control
 - j. Sleep mode
 - k. Dual setpoint control
 - l. Filter life and power consumption display
- G. Unit shall be capable of refrigerant piping in 4 different directions.
- H. Unit shall be capable of drain piping in 2 different directions.
- I. Fan Assembly: The unit shall have a single, direct driven, crossflow tangential Sirocco fan made of high strength ABS BSN-7530 polymeric resin. The fan impeller shall be statically and dynamically balanced. The fan motor is Brushless Digitally controlled (BLDC) with

permanently lubricated and sealed ball bearings. The fan motor shall include thermal, overcurrent and low RPM protection. The fan/motor assembly shall be mounted on vibration attenuating rubber grommets. The fan speed shall be controlled using microprocessor based direct digitally controlled algorithm. In cooling mode, the indoor fan shall have the following settings: Low, Med, High, Power Cool, and Auto. In heating mode, the indoor fan shall have the following settings: Low, Med, High, and Auto. Unit shall have factory installed motorized louver to provide flow of air in up and down direction for uniform airflow. Unit shall have factory installed motorized guide vane to control the direction of flow of air from side to side.

- J. Filter Assembly: The return air inlet shall have a factory supplied removable, washable filter with antifungal treatment. The unit shall have the option for a secondary plasma filter accessory. The filter access shall be from the front of the unit.
- K. Coil Assembly: Unit shall have a factory built coil comprised of aluminum fins mechanically bonded on copper tubing. The copper tubing shall have inner grooves for high efficiency heat exchanger. Unit shall have a minimum 2 row coil, 18 fins per inch. Unit shall have a factory supplied condensate drain pan below the coil constructed of EPS (expandable polystyrene resin). Unit shall be designed for gravity drain. Unit shall have a factory insulated drain hose to handle condensate. Unit shall have provision of 45° flare refrigerant pipe connections. The coil shall be factory pressure tested at a minimum of 551 psig.
- L. All refrigerant piping from outdoor unit to indoor unit shall be field insulated.
- M. Microprocessor Control: The unit shall have a factory installed microprocessor controller capable of performing functions necessary to operate the system. The unit shall be able to communicate with other indoor units and the outdoor unit using a field supplied minimum of 18 AWG, 2 core, stranded and shielded communication cable. The unit controls shall operate the indoor unit using one of the five operating modes:
 - a. Auto changeover (Heat Recovery System only)
 - b. Heating
 - c. Cooling
 - d. Dry
 - e. Fan only
- N. Electrical: The unit electrical power shall be 208-230/1/60 (V/Ph/Hz) The unit shall be capable of operating within voltage limits of +/- 10% of the rated voltage.
- O. Controls: Unit shall use controls provided by the manufacturer to perform all functions necessary to operate the system effectively and efficiently and communicate with the outdoor unit over an RS485 daisy chain.

2.7 CEILING CASSETTE - 4 WAY

- A. Unit shall be factory assembled, wired, piped and run tested. Unit shall be designed to be installed for indoor application. Unit shall be designed to mount recessed in the ceiling and has a surface mounted grille on the bottom of the unit. The unit shall be available in both

2' x 2' and 3' x 3' chassis. Unit shall be capable to be installed with heat pump or heat recovery or cooling VRF system.

- B. Unit case shall be manufactured using galvanized steel plate. The unit shall be provided with an off-white Acrylonitrile Butadiene Styrene (ABS) polymeric resin architectural grille. The grille shall have a tapered trim edge, and a hinged, spring clip (screw-less) return air filter-grille door. Unit shall be provided with metal ears designed to support the unit weight on four corners. Ears shall have pre-punched holes designed to accept field supplied all thread rod hangers.
- C. Cabinet Assembly: Unit shall have four supply air outlets and one return air inlet. The supply air outlet shall be through four-directional slot diffuser each equipped with independent oscillating motorized guide vane designed to change the airflow direction. The grille shall have a discharge range of motion of 40° in an up/down direction with capabilities of locking the vanes. The unit shall have a guide vane algorithm designed to sequentially change the predominant discharge airflow direction in counterclockwise pattern. Guide vanes shall provide airflow in all directions. Unit shall be equipped with factory installed temperature thermistors for:
 - a. Return air
 - b. Refrigerant entering coil
 - c. Refrigerant leaving coil
- D. Unit shall have a factory assembled, piped and wired electronic expansion valve (EEV) for refrigerant control.
- E. Unit shall have a built-in control panel to communicate with other indoor units and to the outdoor unit.
- F. The unit shall have factory designated branch duct knockouts on the unit case.
- G. The unit shall have provision of fresh air ventilation through a knock-out on the cabinet.
- H. The branch duct knockouts shall have the ability to duct up to ½ the unit airflow capacity.
- I. The branch duct cannot be ducted to another room.
- J. Unit shall have the following functions as standard:
 - a. Self-diagnostic function
 - b. Auto addressing
 - c. Auto restart function
 - d. Auto changeover function (Heat Recovery system only)
 - e. Auto operation function
 - f. Child lock function
 - g. Forced operation
 - h. Dual thermistor control
 - i. Sleep mode
 - j. Dual setpoint control

- k. Multiple aux heater applications
 - l. Filter life and power consumption display
- K.. Fan Assembly: The unit shall have a single, direct drive, turbo fan made of high strength ABS HT-700 polymeric resin. The fan impeller shall be statically and dynamically balanced. The fan motor is Brushless Digitally controlled (BLDC) with permanently lubricated and sealed ball bearings. The fan motor shall include thermal, overcurrent and low RPM protection. The fan/motor assembly shall be mounted on vibration attenuating rubber grommets. The fan speed shall be controlled using microprocessor based direct digitally controlled algorithm. In cooling mode, the indoor fan shall have the following settings: Low, Med, High, Power Cool, and Auto. In heating mode, the indoor fan shall have the following settings: Low, Med, High, and Auto. Unit shall have factory installed motorized louver to provide flow of air in up and down direction for uniform airflow.
- L. Filter Assembly: The return air inlet shall have a factory supplied removable, washable filter with antifungal treatment. The unit shall have the option for a secondary plasma filter accessory. The filter access shall be from the bottom of the unit. The unit shall have provision for an optional auto-elevating grille kit designed to provide motorized ascent/descent of the return air grille/pre filter assembly.
- a. The ascent/descent of the return air grille shall be up to a distance of 14-3/4 feet allowing access to remove and clean the filter.
 - b. The auto-elevating grille shall have a control algorithm to accept up, down and stop control commands from the controller.
 - c. The auto-elevating grille shall have a control to stop the descent automatically if a contact is made with any obstacle.
- M. Coil Assembly: Unit shall have a factory built coil comprised of aluminum fins mechanically bonded on copper tubing. The copper tubing shall have inner grooves for high efficiency heat exchanger. Unit shall have a minimum 1 or 2 row coil, 18-19 fins per inch. Unit shall have a factory supplied condensate drain pan below the coil constructed of EPS (expandable polystyrene resin). Unit shall include an installed and wired condensate drain pump capable of providing minimum 27.5 inch lift from bottom surface of the unit. The drain pump shall have a safety switch to shut off the unit if condensate rises too high in the drain pan. Unit shall have provision of 45° flare refrigerant pipe connections. The coil shall be factory pressure tested at a minimum of 551 psig. All refrigerant piping from outdoor unit to indoor unit shall be field insulated.
- N. Microprocessor Control: The unit shall have a factory installed microprocessor controller capable of performing functions necessary to operate the system. The unit shall be able to communicate with other indoor units and the outdoor unit using a field supplied minimum of 18 AWG, 2 core, stranded and shielded communication cable. The unit controls shall operate the indoor unit using one of the five operating modes: Auto changeover (Heat Recovery System only)
- a. Heating
 - b. Cooling
 - c. Dry
 - d. Fan only

- O. Electrical: The unit electrical power shall be 208-230/1/60 (V/Ph/Hz) The unit shall be capable of operating within voltage limits of +/- 10% of the rated voltage.
- P. Controls: Unit shall use controls provided by the manufacturer to perform all functions necessary to operate the system effectively and efficiently and communicate with the outdoor unit over an RS485 daisy chain.
- Q. Provide manufacturers's ventilation kits.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The VRF system shall be installed in accordance with the manufacturer's printed installation instructions.
- B. All system components shall be furnished by the system manufacturer.
- C. Coordinate the exact location of thermostats and sensor in the field with the Architect.
- D. Refrigerant piping line sets layouts indicated on the Drawings is schematic and the installation shall be arranged to conform to the VRF manufacturer's requirements.

3.2 LOCATION

- A. Locate indoor and outdoor units as indicated on drawings. Provide service clearance per manufacturer's installation manual. Adjust and level outdoor units on support structure.
- B. For climates that experience snowfall, mount the outdoor unit a minimum of 12" above the average snowfall line. In climates where this height requirement proves unfeasible, the outdoor units may be installed at the average snowfall line provided regular snow removal in the area surrounding the units keeps the snow line below the bottom of the units.

3.3 COMPONENT PIPING

- A. Installing contractor shall provide and install all accessories and piping for a fully operational system. Refer to manufacturer's installation manual for full instructions.
- B. Traps, filter driers, and sight glasses are NOT to be installed on the refrigerant piping or condensate lines.
- C. Standard ACR fittings rated for use with R410A are to be used for all connections. Proprietary manufacturer-specific appurtenances are not allowed.
- D. Refrigerant pipe for CITY MULTI shall be made of phosphorus deoxidized copper, and has

two types. ACR Type-L "Annealed Temper": Soft copper pipe, can be easily bent with human's hand. ACR Type L "Drawn Temper": Hard copper pipe (Straight pipe), being stronger than Type-O pipe of the same radical thickness.

- E. The maximum operation pressure of R410A air conditioner is 4.30 MPa [623psi] . The refrigerant piping should ensure the safety under the maximum operation pressure. Refer to recommend piping specifications in Mitsubishi Electric's engineering manual. Pipes of radical thickness 0.7mm or less shall not be used.
- F. Flare connection should follow dimensions provided in manufacturer's installation manuals.

3.4 INSULATION

- A. Refrigerant lines, as well as any valves, shall be insulated end to end with ½" closed-cell pipe insulation. If state or local codes require insulation other than that specified above, the greater insulation shall be used.

3.5 ELECTRICAL CONNECTIONS

- A. Division 16 shall provide all power 110 volts or greater. Control wiring and devices, shall be furnished and installed by this Division.
- B. Provide interconnecting connections and wiring between condensate pumps secondary float switch contacts and indoor heat pump unit condensate control wiring. Refer to the Plumbing Drawings for secondary pump locations and heat pump units to be interfaced with.

PART 4 - VARIABLE REFRIGERANT VOLUME AIR CONDITIONING SYSTEM ALTERNATIVE

4.1 GENERAL

- A. The alternate equipment supplier shall provide to the bidding mechanical contractor a complete equipment data package. This package shall include, but is not limited to, equipment capacities at the design condition, power requirements, indoor units CFM/static pressures, fan curves, installation requirements, and physical dimensions. Nominal performance data is not acceptable.
- B. The mechanical contractor shall request and receive the equipment data package 15 days prior to bid date and submit this package with the alternate bid.
- C. The mechanical contractor shall list the equipment supplier and submit the required data package with the bid detailing a complete comparison of the proposed alternate equipment to the specified equipment and the associated cost reduction of the alternate equipment. The contractor bids an alternate manufacturer with full knowledge that the

manufacturer's product may not be acceptable or approved.

- D., All equipment must have visible and permanent label clearly identifying the original manufacturer of the equipment. These labels shall have original manufacturer's name and contact information and be located both inside and outside the equipment and on all equipment-related literature. Submittals shall include the above statement as confirmation by supplier that all conditions are agreed to and complied to. Failure to comply with these requirements shall be sufficient cause for rejection of the submittal and product with no further consideration.
- E. The alternate equipment supplier shall furnish a complete drawing package to the mechanical contractor 15 days prior to bid day for bidding and installation. The drawing format shall be .dxf or equivalent, on 30"x42" sheets. The HVAC and electrical series design documents will be made available in electronic format for use by the equipment supplier in preparing their drawings. The alternate equipment supplier shall prepare the following drawings:
- HVAC Floor Plan
 - HVAC Refrigerant Piping Plan
 - HVAC Refrigerant Piping/Controls Details
 - HVAC Details
 - HVAC Schedules
- F. The alternate equipment supplier shall draft all piping circuits, components, overall building control schematic, detailed control wiring diagrams, system details and schedules for their system. The drawings shall convey all requirements to successfully install the alternate equipment suppliers system.
- G. Provide (2) drawing package sets plotted on 20 lb. vellum. Provide (1) drawing package in electronic format (.dxf files) on CD.
- H. The submitted documents shall be complete system designs and show no less information than the HVAC equipment/controls contract bid documents.

END OF SECTION 238100

SECTION 15700 - VARIABLE REFRIGERANT FLOW BUILDING
MANAGEMENT SYSTEM - BID ALTERNATE NO. 3

PART 1 - GENERAL PROVISIONS

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 SCOPE OF WORK

- A. VRF System Building Management
- B.. Central monitoring controls and control wiring.

1.3 RELATED WORK

- A. Section 230500 - Common Work Results for HVAC.
- B. Section 230800 - Commissioning of Systems.
- E. Section 233000 - Basic Materials & Methods
- G. Section 238100 - Variable Refrigerant Flow Air Conditioning System.
- H. All other Sections of Division 26.

1.4 QUALITY ASSURANCE

- A. The building management system shall be of manufactured the same manufacturer as the variable refrigerant flow air conditioning system described in Section 238100. The building management system shall be fully compatible with the variable refrigerant flow air conditioning systems.
- B. The system equipment shall be manufactured in a facility registered to ISO 9001 and ISO 14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
- C. All wiring shall be in accordance with the National Electrical Code (NEC).
- C. The equipment shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.

- D. The VRF systems BMS shall be installed by a factory authorized licensed mechanical contractor trained by the VRF equipment manufacturer or certified manufacturer's agent.

1.5 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 230550.
- B. Submit manufacturer's installation instructions under provisions of Section 230500.
- C. Submit unit performance data including: capacity, nominal and operating performance.
- D. Submit Mechanical Specifications for unit and accessories describing construction, components and options. This shall include drawings indicating overall dimensions as well as installation, operation and services clearances.
- E. Submit data on electrical requirements and connection points. Include recommended wire and fuse sizes or MCA, sequence of operation, safety and start-up instructions. Coordinate with Division 26 to obtain all 120 volt or greater power connections.
- F. Prepare and submit for approval, VRF BMS Systems Fabrication Drawings drawn s. This shall include wiring schematics, equipment locations and procedures for set-up.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit manufacturer's descriptive literature, operating instructions, and maintenance and repair data under provisions of section 15010.

1.7 STORAGE AND HANDLING

- A. All VRF equipment shall be stored protected from weather, extreme temperature, etc. as suggested by the manufacturer. All VRF equipment shall be moved, listed, etc. as suggested by the manufacturer.

1.8 WARRANTY

- A. The units shall be covered by the manufacturer's limited warranty for a period of one (1) year from date of installation.
- B. The system must be installed by a contractor that has successfully completed the manufacturers service course, AND verified with a completed commissioning report submitted to and approved by the manufacturers's Service Department.
- C. The BMS's shall be covered by an extended manufacturer's limited warranty for a period of five (5) years from date of installation..

- D. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer and shall include labor.

1.9 COMMISSIONING

- A. Commissioning shall be performed by the manufacturer or certified manufacturer's agent.

1.10 SCOPE OF WORK

- A. The building management system shall interface with the of a low voltage controls and communication network provided under SECTION 238100-Variable Refrigerant Flow Air Conditioning Systems.
- B. Unitary built-in controllers with on-board communications and a web-based operator interface shall be provided. A web controller with a network interface card shall gather data from this system and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.
- C. System controls and control components shall be installed in accordance with the manufacturer's written installation instructions.
- D. Furnish energy conservation features such as optimal start, night setback, request-based logic, and demand level adjustment of overall system capacity as specified in the sequence.
- E. System shall provide direct and reverse-acting on and off algorithms based on an input condition or group conditions to cycle a binary output or multiple binary outputs.
- F. Provide capability for future system expansion to include monitoring and use of occupant card access, lighting control and general equipment control.
- G. System shall be capable of email generation for remote alarm annunciation.
- H. Control system start-up shall be a required service to be completed by the manufacturer or a duly authorized, competent representative that has been factory trained in Mitsubishi controls system configuration and operation. The representative shall provide proof of certification for Mitsubishi CMCN Essentials Training and/or CMCN Hands-On Training indicating successful completion of no more than two (2) years prior to system installation. This certification shall be included as part of the equipment and/or controls submittals. This service shall be equipment and system count dependent and shall be a minimum of one (1) eight (8) hour period to be completed during normal working hours.

PART 2 - PRODUCTS

2.1 CENTRALIZED CONTROLLER (WEB-ENABLED)

- A. Centralized Controller: The Centralized Controller shall be capable of controlling a maximum of 50 indoor units across multiple outdoor units. The Centralized Controller shall be approximately 7-1/2"x12" in size and shall be powered from a Power Supply Unit. The Centralized Controller shall support system configuration, daily/weekly scheduling, monitoring of operation status, night setback settings, free contact interlock configuration and malfunction monitoring. The Centralized Controller shall have five basic operation controls which can be applied to an individual indoor unit, a group of indoor units (up to 50 indoor units), or all indoor units (collective batch operation). This basic set of operation controls for the Centralized Controller shall include on/off, operation mode selection (cool, heat, auto, dry, and fan, temperature setting, fan speed setting, and airflow direction setting. The centralized control shall be able to enable or disable operation of local remote controllers. In terms of scheduling, the Centralized Controller shall allow the user to define both daily and weekly schedules with operations consisting of ON/OFF, mode selection, temperature setting, air flow (vane) direction, fan speed, and permit/prohibit of remote controllers. All Centralized Controllers shall be equipped with one RJ-45 Ethernet port to support interconnection with a network PC via a closed/direct Local Area Network (LAN). The Centralized Controller shall be capable of performing initial settings via the 9" high-resolution, backlit, color touch panel on the controller or via a PC using the AG-150 Centralized Controller's initial setting browser. Standard software functions shall be available so that the building manager can securely log into each AG-150 via the PC's web browser to support operation monitoring, scheduling, error email, interlocking and online maintenance diagnostics. Additional optional software functions of personal browser for PCs and MACs and Tenant Billing shall be available. The Tennant Billing function shall require TG-2000 Integrated System software in conjunction with AG-150 Centralized Controllers.

AG-150 (Centralized Controller)			
Item	Description	Operation	Display
ON/OFF	Run and stop operation.	Each Block, Group or Collective	Each Group or Collective
Operation Mode	Switches between Cool/Dry/Auto/Fan/Heat. (Group of Lossnay unit: automatic ventilation/vent-heat/interchange/normal ventilation) Operation modes vary depending on the air conditioner unit. Auto mode is available for the R2/WR2-Series only.	Each Block, Group or Collective	Each Group
Temperature Setting	Sets the temperature from 57°F – 87°F depending on operation mode and indoor unit.	Each Block, Group or Collective	Each Group

AG-150 (Centralized Controller)			
Item	Description	Operation	Display
Set Temperature Range Limit	The range of room temperature setting can be limited by the initial setting. The lowest limit temperature can be made higher than the usual (67°F) in cool/dry mode, while the upper limit temperature lower than the usual (83°F) in heat mode.	Each Group	Each Group
Fan Speed Setting	Available fan speed settings depending on indoor unit.	Each Block, Group or Collective	Each Group
Air Flow Direction Setting	Air flow direction settings vary depending on the indoor unit model. *1. Louver cannot be set.	*1 Each Block, Group or Collective	Each Group
Schedule Operation	Annual/weekly/today schedule can be set for each group of air conditioning units. Optimized start setting is also available. *1. The system follows either the current day, annual schedule, or weekly, which are in the descending order of overriding priority. Twenty-four events can be scheduled per day, including ON/OFF, Mode, Temperature Setting, Air Direction, Fan Speed and Operation Prohibition. Five types of weekly schedule (seasonal) can be set. Settable items depend on the functions that a given air conditioning unit supports.	*2 Each Block, Group or Collective	Each Group
Optimized Start	Unit starts 5 - 60 minutes before the scheduled time based on the operation data history in order to reach the scheduled temperature at the scheduled time.	Each Block, Group or Collective	Each Block, Group or Collective
Night Setback Setting	The function helps keep the indoor temperature in the temperature range while the units are stopped and during the time this function is effective.	Each Group	Each Group
Permit / Prohibit Local Operation	Individually prohibit operation of each local remote control function (Start/Stop, Change operation mode, Set temperature, Reset filter). *3. Centrally Controlled is displayed on the remote controller for prohibited functions.	Each Block, Group or Collective	*3 Each Group
Room Temp	Displays the room temperature of the group.	N/A	Each Group

AG-150 (Centralized Controller)			
Item	Description	Operation	Display
Error	When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed *4. When an error occurs, the LED flashes. The operation monitor screen shows the abnormal unit by flashing it. The error monitor screen shows the abnormal unit address, error code and source of detection. The error log monitor screen shows the time and date, the abnormal unit address, error code and source of detection	N/A	*4 Each Unit or Collective
Ventilation Equipment	This interlocked system settings can be performed by the master system controller. When setting the interlocked system, use the ventilation switch the free plan LOSSNAY settings between "Hi", "Low" and "Stop". When setting a group of only free plan LOSSNAY units, you can switch between "Normal ventilation", "Interchange ventilation" and "Automatic ventilation".	Each Group	Each Group
Multiple Language	Other than English, the following language can be chosen. Spanish, French, Japanese, Dutch, Italian, Russian, Chinese, and Portuguese are available.	N/A	Collective
External Input / Output	By using accessory cables you can set and monitor the following. Input By level: "Batch start/stop", "Batch emergency stop" By pulse: "batch start/stop", "Enable/disable remote controller" Output: "start/stop", "error/Normal" *5. Requires the external I/O cables (PAC-YG10HA-E) sold separately.	*5 Collective	*5 Collective
Free Contact Interlock Control	Operation of indoor groups, general equipment or free contact outputs based on group(s) conditions or free contact(s) input states.	Each Group, Output or Collective	N/A

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The VRV BMS shall be installed in accordance with the manufacturer's printed installation instructions.
- B. All system components shall be furnished by the system manufacturer.
- C. Coordinate the exact location of components in the field with the Architect.
- D. The installation shall be arranged to conform to the VRF manufacturer's requirements.

3.2 ELECTRICAL CONNECTIONS

- A. Division 26 shall provide all power 110 volts or greater. Control wiring and devices, shall be furnished and installed by this Division.

END OF SECTION 238120

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The following drawings indicate the work required for this Division of Work:
- All Drawings associated with this project.
All other contract drawings and specifications associated with the project.
- B. Certain items of work pertaining to the work of this Division are provided under other Divisions of the Specification. These include, but are not limited to the following:
1. Excavating and backfilling for underground primary and secondary electric, telephone, television, and other building services provided under this Division.
 2. Concrete work for equipment bases, transformer and switching pads, etc.
 3. Installation of access doors in finished construction.
 4. Installation of pipe sleeves in walls and floors.
 5. Framing of openings in walls, floors, roof.
 6. Chases, soffits, furred spaces required to conceal work of this Division.
- C. Materials furnished under other Divisions and installed and/or wired by this Division include, but are not limited to:
1. Mechanical Equipment. (Motor Starters furnished under Division 23)
 2. Temperature Controls.
 3. Sprinkler tamper and flow switches and accessories.
 4. Miscellaneous architectural items such as overhead doors, projection screens, kitchenette units, etc.
 5. Elevator equipment, including power for machine and controls, trail cable, receptacle and telephone outlet(s) in equipment room, light and receptacle in pit(s).
- D. Complete Utility connections as indicated or needed, extension to Project, metering as required, and connection to building systems. This work includes:

1. Apply for all services and pay for all fees, assessments, and charges of the Utility for each connection, all in a timely manner and according to the Project Schedule.
 2. Provide and install all metering and accessories as required by Utility, make entire service in accordance with the Utility's requirements or other applicable regulation.
 3. All necessary coordination with Utility to determine scope of work provided by Utility and part provided by Contractor so that a complete Utility connection is made.
- E. Participate in coordination of Mechanical and Electrical installations. Provide additional coordination drawings, as directed by Architect, in areas of potential interferences.
- F. All work shall comply with applicable codes and regulations, including, but not limited to the following:
1. Connecticut Building, Fire Safety, and Health Codes, as amended, including all codes, standards and regulations referenced therein.
 2. Requirements of Local, State, and Federal authorities having jurisdiction over the Work.
 3. Current regulations of the Occupational Safety and Health Administration (OSHA).
 4. Requirements of affected Public Utility Companies.
 5. Special requirements set down by the Owner, the Owner's Insurance Carrier, or other concerned entities.
 6. NFPA 70- 2014, National Electrical Code. Contractor shall conform to the latest State of Connecticut approved NFPA 70, codes. Supply, install and wire complete any devices or equipment required by code indicated or excluded.
 7. Contractor shall supply temporary power sufficient enough to carry the load of the building(s) to be renovated. Provide temporary lighting and power in conformance to OSHA regulations.

1.2 RELATED DOCUMENTS

- A. Instructions to Bidders, the General Provisions of the Contract, including General Conditions and General Requirements shall apply and be binding to the Contractor and/or Subcontractor who performs this work.
- B. Where items of the General Conditions or Special Conditions are repeated in this Section of the Specifications, it is intended to call particular attention to or to qualify them; it is not intended that any other parts of the General Conditions shall be assumed to be omitted if not repeated herein.

1.3 INTENT

- A. Intent of the specifications and drawings is to call for finished work, tested and ready for operation.
- B. Material, fixtures, and equipment mentioned in specifications or shown on drawings shall be furnished new, completely installed adjusted and left in a clean, safe and satisfactory condition ready for operation. All supplied appliances and connections of every sort necessary shall be furnished and installed to the satisfaction of Architect and Owner.
- C. Apparatus, appliances, material or work not shown on the plans but mentioned in specifications, or vice versa, or any incidental accessories such as electrical disconnect switches, circuit breakers, etc., necessary to make the work complete, serviceable and perfect in all respects and ready for operation, even though not particularly specified, shall be installed without additional expense to the Owner.
- D. Minor details not usually shown or specified, but necessary for proper installation and operation shall be included in the work as though herein specified or shown.
- E. Prior to submission of bids, give written notice to Architect of any materials or apparatus believed to be inadequate or unsuitable, in violation of laws, ordinances, rules or regulations of authorities having jurisdiction; or any necessary items or work omitted. In the absence of such written notice, it is mutually agreed that the cost of all required items has been included and that all systems will function satisfactorily without extra compensation.

1.4 DEFINITIONS

- A. "Architect" means Patriquin Architects, New Haven, CT 06513.
- B. "Engineer" means Acorn Consulting Engineers, Inc., West Simsbury, CT 06092
- C. "regulating authorities" or "authorities", means all Governmental, Utility, and Insuring Authorities having jurisdiction.
- D. "Subcontractor or Contractor", means specifically the Subcontractor working under his respective Section of Specifications.
- E. "furnish" or "provide" means to supply, erect, install and connect up complete in readiness for regular operation the particular work referred to, unless otherwise specified.
- F. "conduit" includes in addition to pipe, all fittings, connectors, hangers, and other accessories relating to such and the plant and labor necessary to install same.
- G. "concealed" means hidden from sight in chases, furred spaces, hung ceilings, embedded in construction, or buried underground.

- H. "exposed" means not "concealed" as defined above. Trenches, crawl spaces and tunnels shall be considered "Exposed" unless specifically noted otherwise.
- I. "wire" or "wire up" means to properly connect the related item to the appropriate source of power including all needed connectors, circuit breakers, switches and other items necessary for normal operation of the item.
- J. "temperature control" means, in addition to thermostats all heating, ventilating, air conditioning motorized dampers, solenoid valves, electrical air device actuators, relays and other electrical accessories related to HVAC and other mechanical systems.
- K. "concealed" means hidden from sight as in chases, furred spaces, shafts, or above ceilings.

1.5 DRAWINGS

- A. Drawings are generally diagrammatic and are intended to convey the scope of work and indicate general arrangement. Deviations from the depicted arrangement shall be approved by the Architect.
- B. Location of all items shown on drawings or called for in specifications, not definitely fixed by dimension, are approximate only. Exact location necessary to secure best conditions and results shall be determined at the project and shall have the approval of the Architect.
- C. Follow the drawings in laying out work. Check drawings of other trades to verify spaces in which work will be installed to insure maximum headroom and space conditions. Where headroom or space conditions appear inadequate, the Architect shall be notified before proceeding with installation.
- D. Work shown on the drawings is intended to be approximately correct to the scale of the drawings. Figured dimensions and detailed drawings are in all cases to take precedence over them. Typical details shall apply to each and every item of the project where such items are incorporated. Drawings utilize symbols and schematic diagrams to indicate various items of work. These have no dimensional significance, nor do they delineate every item required for the intended installation. Work shall be installed in accordance with the diagrammatic intent of the Electrical drawings, and in conformity with the dimensions indicated on final Architectural and Structural working drawings and on equipment shop drawings.
- E. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete work are excluded.
- F. Details appear on the drawings which are specific with the regard to the dimensioning and positioning of the work. These are intended for the purpose of establishing general feasibility. They do not obviate field coordination.
- G. If directed by the Architect or Owner, make reasonable modifications in the layout to prevent conflict with work of other trades or for proper execution of the work.

- H. Abide by and comply with the true intent of the drawings and specifications taken as a whole, to provide a complete job ready for operation. "Drawings and specifications taken as a whole" means all contract plans and specifications -- Architectural, Structural and all Subcontractors' drawings and specifications. Refer to drawings and specifications of other trades to check if equipment or items included under other Sections will require work in order to comply with the statement above "to provide a complete job ready for operation". This work shall be included in the Base Contract. It shall be understood that the indication and/or description of any item, on the drawings or specifications, or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated.
- I. No statement in the specifications or any omission in either plans or specifications should be misunderstood as relieving the contractor from providing a complete job ready for operation. All existing circuits and devices shall be energized and tested before the completion of the project, contractor shall supply all the required material, labor and equipment necessary for a complete installation. No exclusions from, or limitations in, the language used in drawings or specifications shall be interpreted as meaning that the items or accessories necessary to complete any required system or item of equipment are to be omitted.
- J. Information as to the general construction shall be derived from Structural and Architectural Drawings and Specifications only.
- K. The use of words in the singular shall not be considered as limiting where other indications indicate that more than one item is referred to.

1.6 VISITING THE SITE FOR SURVEYS AND MEASUREMENTS

- A. Before submitting a Bid, visit the site and 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. Reference all Work from these established lines and levels. Verify all measurements at site and check the correctness of same as related to 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 and do not proceed with the Work until instructions have been received from the Engineer.

1.7 SUBSTITUTIONS

- A. Within sixty (60) days after award of contract, submit, through the General Contractor, to the Architect for review, a list of manufacturers of all materials and equipment proposed for use on the project. Indicate on submittal which items are substituted.

- B. A review, without exception, of this list does not constitute approval, nor does it guarantee acceptance of the shop drawings when submitted.
- C. The contractor's intent to purchase the exact make specified does not relieve him from the responsibility to submit this list. Failure to submit this list will require the contractor to supply the exact item specified as the basis for design.
- D. Submittal of items which differ from those specified or indicated as the basis for design carries the implicit guarantee that the substituted item will provide the intended service and is compatible with other items or systems interfacing with it.
- E. When proposing a substitute item, the contractor is responsible for all costs of accommodating the substitution, including, but not limited to, space and accessibility, modifications required to other systems, structural adequacy and the like.
- F. If substitutions require the Architect or Engineer to prepare sketches or revised drawings in order to become acceptable, the cost of such sketches, drawings, or engineering shall be borne by the contractor.
- G. When substitutions require Engineer or Architect to spend an inordinate time for review or substitutions, the cost of review over four (4) hours will be charged to the contractor who made the submittal.

1.8 MATERIALS AND WORKMANSHIP

- A. All materials and apparatus required for the Work, except as otherwise specified, must be new and of first-class quality and be furnished, delivered, erected, connected and finished in every detail and so selected and arranged as to fit properly into the building spaces. Where no specific kind of quality of material is given, furnish a first- class standard article as accepted by the Engineer.
- B. Furnish the services of an experienced superintendent who is constantly in charge of the installation of the Work, and present on site at all times during the Work. Furnish all skilled Workmen, helpers and labor required to install, unload, transfer, erect, connect up, adjust, start, operate and test each system.
- C. Unless otherwise specifically indicated on the Drawings or in the Specifications, all equipment and materials must 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. Quality of Work must be consistent with good trade practice and installed in a neat Workmanlike manner. The Engineer reserved the right to reject any Work which, in his opinion, has been installed in a substandard, dangerous or unserviceable manner. Replacement of said Work, in satisfactory manner, will be at no extra charge to the Owner.

1.9 SHOP DRAWINGS

- A. After acceptance of List of Manufacturers required under paragraph 1.07(A) of this Section, and prior to delivery of materials and equipment to the project site, submit eight (8) copies of shop drawings of each item for review by the Architect.
- B. Each submittal shall contain a complete list of all materials contained within. Include intended use for each item.
- C. Shop drawings shall consist of manufacturer's scale drawings, cuts or catalogs, including descriptive literature and complete characteristics of equipment, including, but not limited to, dimensions, capacity, code compliance, motor and drive and testing, construction, electrical characteristics, support, all as required for this project.
- D. Architect may designate submittal of physical samples for review on items where actual color, texture or other characteristics might not be adequately described by a drawing or written material. Upon approval of a sample, each and every item of that sort must be identical to the approved sample.
- E. Samples, drawings, specifications, catalogs, etc., submitted for review shall be labeled indicating specific service for which material or equipment is to be used, Section and Article Number of Specification governing, Subcontractor's name and name of project.
- F. Approval rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are reviewed, said review does not mean that drawings have been checked in detail; said review does not in any way relieve the Subcontractor from his responsibility of furnishing material or performing work according to Contract Documents.
- G. Failure to submit shop drawings in ample time for checking shall not be cause for an extension of contract time, and no claim by reason of such default will be allowed.
- H. Submittals for all systems which require the interconnection of three or more devices shall include a system block diagram. The diagram shall be of the one line type and with sufficient detail to show interfaces and method of operation.
- I. Material or equipment installed prior to review shall be liable for removal and replacement at no extra charge to the Owner if the material or equipment does not meet the intent of Drawings and Specifications.

1.10 RECORD DRAWINGS

- A. Maintain a record set of Electrical Drawings at the job site on which any changes in location of equipment, devices, panels and major conduits are recorded.
- B. At the end of construction, provide the Owner with a complete set of As-Built Drawings, including all power and lighting plans (indicating as-built circuiting), power and special systems riser diagrams and panel schedules and fire alarm use. Prepare As-Built

documentation utilizing the most recent version of AutoCAD. Provide the Owner with a "CD ROM" disk and one set of reproducible mylar documents.

- 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.
- D. Exact location of all conduits and utilities under floor slabs shall be indicated and dimensioned on these drawings, as well as the final arrangement of conduits and junction boxes in concealed chases, concealed in walls or above ceilings.

1.11 LAWS, ORDINANCES, CODES, PERMITS AND FEES

- A. Give all necessary notices, obtain all permits and pay all governmental taxes, fees and other costs in connection with the work. File all necessary plans, prepare all documents and obtain all necessary approvals of governmental departments having jurisdiction. Obtain all required Certificate of Inspection of the work and deliver to Architect prior to application for final payment.
- B. Materials furnished and work installed shall comply with the rules and recommendations of the National Board of Fire Underwriters, with all requirements of utility companies, with the Board of Health, with the recommendations of the fire insurance rating organization having jurisdiction, with the local and state building codes, and with the requirements of all governmental departments having jurisdiction. If contract requirements are in excess of applicable codes, rules or regulations, contract provisions shall be given precedence.
- C. Provide utility services as required and as indicated on Drawings and in 1.01(D), above.

1.12 ROYALTIES AND PATENTS

- A. Pay all royalties and defend all suits and claims for infringement of any patent rights and save the Owner harmless on account thereof.
- B. If it is observed that a process or article specified is an infringement of a patent, promptly notify the Architect in writing. If any work is performed knowing it is to be an infringement of a patent, all costs arising therefrom shall be borne by the Contractor.

1.13 STANDARD SPECIFICATIONS

- A. Certain standard and staple materials may be described by reference to standard specifications. The standards referred to are as follows:

ASA	American Standards Association
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials

NBFU	National Board of Fire Underwriters
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
UL	Underwriters Laboratories, Inc.
NFPA	National Fire Protection Association
FM	Factory Mutual Insurance Company
IRI	Industrial Risk Insurers (Formerly FIA)
IES	Illuminating Engineering Society
IEEE	Institute of Electrical and Electronic Engineers

- B. The particular specification will be identified by appropriate prefix and number only, with the latest or legally defined revision being applicable.

1.14 INTERPRETATION OF PLANS AND SPECIFICATIONS

- A. Questions or disagreements arising as to the intent of the specifications or the drawings, or the kind and quality of work required thereby, shall be decided by the Architect whose interpretation thereof shall be final, conclusive and binding on all parties.

1.15 PROCEDURE OF WORK

- A. All work shall proceed in a manner approved by the Architect.
- B. Determination of the required job procedure will be made by the Architect in the best interests of the job and may be adjusted to meet job conditions.

1.16 CHANGES TO WORK

- A. During the progress of the work, the Architect may make any changes, alterations, additions or omissions to work drawn or specified after having agreed on an equitable allowance to be added to or deducted from the contract price. Claims for extra cost to cover extra work will not be allowed unless specifically authorized in writing by the Architect prior to the execution of such additional work.

1.17 COORDINATION OF TRADES

- A. Give full cooperation to other trades and furnish any information necessary to permit the work of all trades to be installed satisfactorily and with least possible interference or delay.

1.18 PROTECTION OF WORK AND PROPERTY

- A. Be responsible for the maintenance and protection of equipment, materials and tools stored or installed on the job site, from loss or damage of all causes, until final acceptance by the Owner.
- B. Be responsible for the protection of finished work of other trades from damage or defacement and remedy any such injury at no additional cost to the Owner.

1.19 CUTTING, PATCHING AND PAINTINGS

- A. Cutting, patching and painting shall be done by the General Contractor unless otherwise noted on plans or specifications.
- B. Cooperate with the General Contractor in making sure that sleeves are set and chases provided for the installation of the work. If failure to do so makes it necessary to cut and patch any part of the completed structure, this shall be done at the expense of the subcontractor having jurisdiction over the work.

1.20 TEMPORARY OPENINGS

- A. Ascertain whether any special temporary openings in the building will be required for the admission of apparatus and notify the Contractor accordingly.
- B. Failure to give sufficient notice to the Contractor in time to arrange for these openings during construction, shall result in this subcontractor's assumption of all costs pertaining to making and repairing any such temporary openings.

1.21 MANUFACTURER'S IDENTIFICATION

- A. Manufacturer's nameplate, name or trademark shall be permanently affixed to all material and equipment furnished under this specification. The nameplate of a subcontractor or distributor will not be acceptable.

1.22 MANUFACTURERS IDENTIFICATION

- A. Identify each control and item of equipment with a permanently attached nameplate made of black surface, white core laminated plastic with incised letters, bearing the name of the equipment item and designation of the item taken from the drawings or schedules.
- B. Identify electrical feeders and risers where they enter or leave a junction box or cabinet with fiber tags having the cable designation stamped thereon and tied securely to each cable or by means of printed plastic self-adhering labels attached to the cable sheath.
- C. Subcontractor shall label all cabinet, panels, pull boxes, etc., in the electrical system using the designations shown on the plans and schedules such as -- "PANEL H1", "MDP-1", etc., using incised laminated plastic nameplates securely attached.
- D. Provide typewritten directory cards in all electric panels showing circuit numbers and area or load serviced.
- E. Refer to Section 260553.

1.23 INSTRUCTION BOOKS AND OPERATING INSTRUCTIONS

- A. Furnish three (3) sets of operating and maintenance manuals in hard cover covering all

electrical systems in the project. Include manufacturer's approved submittal of each item. Submit for review of Architect.

- B. Manuals shall contain, as a minimum, the following:
1. Description of the project and major subsystems.
 2. Descriptive text covering the startup, adjustment, trouble-shooting, and safe shutdown for each system.
 3. Copies of each typewritten panel directory.
 4. Copies of lighting control wiring diagrams and description of operation.
 5. A schedule of maintenance based on the manufacturer's recommendations, showing what work is to be performed and at what intervals.
 6. Copies of the finally approved submittal for each item, together with the manufacturer's installation, operation, and maintenance instructions and parts lists.
 7. List of Firm names, addresses, telephone numbers to be contacted for regular or emergency service, or purchase of parts.
- C. Manuals shall be arranged in one or more three-ring binders, completely indexed as follows:
1. General information; Items 1, 2, 3, & 7 above.
 2. Control system information; Item 4.
 3. Approved submittal, maintenance, and parts information; Items 5 & 6.
 4. Each section shall be identified by a permanent index tab.
 5. Each item within a major section shall be separately indexed for quick reference.
- D. Provide adequate written and/or verbal instructions to the Owner's operating personnel and such others as the Owner may designate. As a minimum, contractor shall provide for three (3), eight hour working days of instructions. Individual equipment or system Specifications may require additional or different periods of instruction.

1.24 SLEEVES, INSERTS AND ANCHOR BOLTS

- A. Be responsible for the location and proper position of sleeves and anchor bolts. If failure to do so requires cutting and patching of finished work, it shall be done at the Subcontractor's expense.

- B. Conduits passing through concrete or masonry floors, walls or partitions shall be provided with sleeves having an internal diameter 1/2" larger than the outside of the conduit.
- C. Sleeves through concrete floors or interior masonry walls shall be Schedule 40 black steel pipe, set flush with wall, floor or ceiling surface. Sleeve through floors shall be packed with a fireproof, resilient material to maintain the fire rating integrity of the assembly and caulked with waterproof compound to the approval of the Architect.
- D. Sleeves through floors of wet areas such as equipment rooms, toilets, etc., shall extend 2" above finished floor surface and be sealed watertight.

1.25 ACCESSIBILITY

- A. Install work so that all parts are readily accessible for inspection, maintenance and repair.
- B. Be fully informed regarding peculiarities and limitations of space available for the installation of materials and apparatus.
- C. See that all equipment items are made easily accessible for adjustment and operation.
- D. Where such items must be located over non-access ceilings, in chases or other inaccessible places, access doors and/or panels of a type and size approved by the Architect shall be supplied and delivered to the General Contractor for installation.
- E. Items requiring access are to be grouped to keep size and quantity of access doors to a minimum.
- F. Access doors installed in walls, floors or ceilings shall have the same fire rating as the wall, floor or ceiling.

1.26 ELECTRICAL WORK

- A. Install and wire up complete all electrical switches, starters and unmounted motors and other electrical equipment supplied by other trades.
- B. Furnish separate disconnect switches for all motors controlled by magnetic starters.
- C. Each trade supplying electrically operated equipment for installation and wiring by this Subcontractor is to furnish sufficiently detailed instructions and wiring diagrams for their installation.
- D. Control devices that include mechanical elements such as float switches, alternators, temperature and pressure switches or controls, damper operators or the like, shall be installed by the trade furnishing them, ready for wiring by this Subcontractor, unless otherwise indicated.
- E. Equipment including a number of electrical items in a single enclosure or common base shall be supplied to the job site internally wired as a unit, to numbered terminals, ready for

wiring connections.

1.27 ELECTRIC MOTORS

- A. Motors shall conform to all applicable regulations and be suitable for the load, duty, voltage, phase, frequency, service and location intended.

1.28 TEMPORARY POWER

- A. Furnish and install all required temporary electrical services, including lighting and ground-fault circuit-interrupter receptacles as required for construction purposes.
- B. In all of the above cases, furnish the appropriate trades, well in advance of their work schedule, with all information, dimensions, templates, wiring diagrams and devices necessary to coordinate the work.
- C. Be responsible for any additional costs incurred as a result of his failure to furnish information sufficiently in advance to allow for proper coordination.

1.29 TESTS

- A. Test systems and equipment as required by the various Sections of the Specifications.
- B. Tests to be witnessed by and to the satisfaction of the Architect or his representative and such others as may have legal jurisdiction.
- C. Work shall be tested, repaired and retested until an approved test is achieved.
- D. Damages resulting from tests shall be repaired or damaged work replaced to the satisfaction of Architect and Owner.
- E. Testing must be completed successfully prior to concealment of the work.
- F. Completed systems shall be tested for proper operation, capacity and function. Insofar as possible, systems normally operated during certain seasons of the year shall be tested during the appropriate season.
- G. Costs of all tests shall be borne by the appropriate Contractor.

1.30 QUIET OPERATION

- A. All equipment shall be isolated from the building structure by approved means. Noises and hum of equipment shall be absorbed or attenuated so as not to be objectionable.
- B. Where sound or vibration levels are considered objectionable by the Architect, they shall be corrected in a manner approved by the Architect, at no additional cost to the Owner.

1.31 USE OF INSTALLATION BY OWNER

- A. Owner shall have the privilege of using any part of the work when sufficiently complete, but such use shall not be considered as an acceptance of the work in lieu of the written certificate from the Architect.

1.32 CLEANUP

- A. Systems, enclosures, and equipment shall be thoroughly cleaned, inside and out, before being placed into operation.
- B. Keep the site free from accumulation of waste materials or rubbish. At conclusion of the work, remove all surplus materials, tools, construction equipment and rubbish from the site and leave the premises in a clean condition.

1.33 GUARANTEE AND SERVICE

- A. Guarantee that all work will be free from defects in workmanship and/or materials and that all apparatus will achieve the capacities and characteristics specified. If, during the period of one (1) year, or as otherwise indicated, from certificate of completion of the work, defects in material or workmanship appear, remedy such defects without cost to the Owner. In default thereof, the Owner may have such work done and charge the cost to the appropriate Contractor or Subcontractor. Also, indemnify the Owner for any property damage which might result from such a defect which made repairs necessary.
- B. Certain equipment will require guarantee periods exceeding one year due to the need for seasonal operation. In such case, the guarantee will extend through at least one full, continuous season.
- C. Any fault in a system shall be corrected, and any work damaged in the course of this correction shall be repaired, replaced and restored to its original condition at no additional cost to the Owner.

1.34 INSURANCE

- A. Fully insure all employees, material and finished work as required by the General Conditions of the Contract.

1.35 SCAFFOLDING, RIGGING AND HOISTING

- A. Unless otherwise indicated, the work of each Section includes all scaffolding, rigging, hoisting and services necessary for the delivery, erection and installation in place of all equipment and apparatus furnished and the removal of same when no longer required.

1.36 PROGRESS SCHEDULE

- A. Keep informed of progress schedules of all other trades and work in accordance with the project schedule to ensure timely completion of this work.

1.37 WORKMANSHIP

- A. All work shall be performed in a neat and workmanlike manner and shall conform to the best trade practices for such work.

END OF SECTION 260500

SECTION 260505 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following electrical materials and methods:
 - 1. Supporting devices for electrical components.
 - 2. Concrete equipment bases.
 - 3. Cutting and patching for electrical construction.
 - 4. Touch-up painting.
 - 5. Meter sockets.
 - 6. Seismic Bracing
 - 7. Electrical Devices
 - 8. Cabinets and Enclosures
 - 9. Grounding
 - 10. Coordination Study and Test

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified.
- C. Shop Drawings detailing fabrication and installation of supports and anchorage for electrical items in accordance of the requirements in section 260500.
- D. Coordination Drawings for electrical installation.
 - 1. Prepare Coordination Drawings according to Division 1 Section "Submittals" to 1/4-inch-equals-1-foot scale for floor plans, 3/8-inch equals 1-foot scale for Mechanical/Electrical rooms or larger, same scale as other trades. Detail major elements, components, and systems of electrical equipment and materials in relation to each other and to other systems, installations, and building components. Indicate locations and space requirements for installation, access, and working clearance. Show where sequence and coordination of installations are important to the efficient flow of the Work. Coordinate drawing preparation with effort specified in other Specification Section. Include the following:
 - a. Provisions for scheduling, sequencing, moving, and positioning large

equipment in the building during construction.

b. Floor plans, elevations, and details, including the following:

- 1) Clearances to meet safety requirements and for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.
- 2) Equipment support details.
- 3) Exterior wall, roof, and foundation penetrations of cable and raceway; and their relation to other penetrations and installations.
- 4) Fire-rated interior and floor penetrations by electrical installations.
- 5) Sizes and locations of required concrete pads and bases.

c. Reflected ceiling plans to coordinate and integrate installing air outlets and inlets, light fixtures, alarm and communication systems components, sprinklers, and other ceiling-mounted items.

E. Samples of color, lettering style, and other graphic representation required for each identification product for Project.

F. Short circuit analysis, coordination study and test.

1.4 QUALITY ASSURANCE

A. Comply with 2014 NFPA 70 for components and installation.

B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed and Labeled": As defined in the National Electrical Code, Article 100.

1.5 SEQUENCING AND SCHEDULING

A. Coordinate electrical equipment installation with other building components.

B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for electrical installations.

C. Coordinate installing required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning prior to closing in the building.

E. Coordinate connecting electrical service to components finished under other Sections.

- F. Coordinate connecting electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- G. Coordinate requirements for access panels and doors where electrical items requiring access are concealed by finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors".

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

- A. Channel and angle support systems, hangers, anchors, sleeves, brackets, fabricated items, and fasteners are designed to provide secure support from the building structure for electrical components.
 - 1. Material: Steel, except as otherwise indicated, protected from corrosion with zinc coating or with treatment of equivalent corrosion resistance using approved alternative finish or inherent material characteristics.
 - 2. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel, except as otherwise indicated.
- B. Steel channel supports have 9/16-inch diameter holes at a maximum of 8 inches o.c., in at least 1 surface.
 - 1. Fittings and accessories mate and match with channels and are from the same manufacturer.
- C. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets. Spring steel clamps or "click"-type hangers are not allowed.
- D. Sheet-Metal Sleeves: 0.276-inch or heavier galvanized sheet steel, round tube, closed with welded longitudinal joint.
- E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- F. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable iron casting with hot-dip galvanized finish.
- G. Expansion Anchors: Carbon-steel wedge or sleeve type.
- H. Toggle Bolts: All-steel springhead type.
- I. Powder-Driven Threaded Studs: Heat-treated steel.

2.2 SEISMIC BRACING

- A. Bracing shall be fabricated from standard structural or trade sections.
- B. Attachments to masonry walls shall be by means of expansion shields and bolts.
- C. Attachment to building structure shall meet approval of Structural Engineer.

2.3 CONCRETE EQUIPMENT BASES

- A. Forms and Reinforcing Materials: As specified in Division 3 Section "Cast-in-Place Concrete."
- B. Concrete: 3000-psi, 28-day compressive strength as specified in Division 3 Section "Cast-in-Place Concrete".

2.4 METER SOCKETS

- A. Meter sockets comply with serving utility company requirements.

2.5 GROUNDING GRID

- A. Provide grounding grids consisting of 3/4 inch by 10 ft copper clad steel driven rods with No. 3/0 bare stranded copper interconnecting cable.

2.6 GROUND BUS

- A. (2 x 1/4) inch copper minimum, mounted on insulating standoffs, complete with lugs for connecting grounding cables.

2.7 SWITCHES AND RECEPTACLES

- A. Switches:
 - 1. 20 Amp - 1P, Hubbell #1221-I.
 - 2. 20 Amp - 2P, Hubbell #1222-I.
 - 3. 20 Amp - 3-Way, Hubbell #1223-I.
 - 4. 20 Amp - 4-Way, Hubbell #1224-I
 - 5. 20 Amp - With Pilot Light, Hubbell #1221-IL.
- B. Receptacles: Specification Grade duplex, three wire, 125 volt, grounding:
 - 1. 20 Amp - Hubbell #5462-I - Ivory.
- C. Face Plates: (With the required number of gangs): Smooth thermoplastic (color selected by Architect) or satin finish stainless 203/204.
- D. Face Plates: (Wet or Damp Locations) Cast aluminum, gasketed, with double lift covers, Hubbell #5205WO.

2.8 GROUND FAULT INTERRUPTER RECEPTACLES

- A. Duplex, 20A, 125 volt AC, specification grade Ivory, ANSI C73.12, NEMA 5-20K, Hubbell #GF5362-I.
- B. Face Plates: Nylon, Ivory, Hubbell #PJ-26 or satin stainless steel 302/304.
- C. Face Plates: (Wet or Damp Locations) Gray cast aluminum, vertical, standard box mounting, gasketed, Hubbell #

2.9 TIMERS

- A. Mark Time Catalogue M9006 - 30 Minute Off.

2.10 DIMMERS

- A. Incandescent 600W to 1000W, Lutron N-1000.
- B. Fluorescent: Two (2) to twenty (20) 40 watt lamps, Lutron FD-20 (I20) (277).
- C. Matching faceplates by Lutron.
- D. Fluorescent dimmer ballasts to be as required by dimmer manufacturer.
- E. Rating: Sizes listed are minimum, larger size to accommodate load shown on Contract Drawings.
- F. Dimmer Boxes: Size as required by dimmer manufacturer and space to avoid derating of dimmer, or break-off of faceplate cooling fins.

2.11 FLOOR TYPE SERVICE FITTINGS

- A. Above floor power service fitting for greater than 3 inch pour.
 - 1. Satin aluminum housing, 3/4 inch nipple, with stainless device plates and 20 amp duplex receptacle, Hubbell SC3091 for one receptacle and Hubbell SC3092 for two duplex receptacles back to back.
 - 2. Full adjustable stamped steel floor box for greater than 3" depth of pour, Hubbell B-2527 shallow (B-2536 deep) with S-2525 cover.
- B. Above floor telephone service fitting for greater than 3 inch pour.
 - 1. Satin aluminum housing, 3/4 inch nipple with stainless steel plate with brushed hole, Hubbell SC3190, (Hubbell 3192 back to back) with floor box (same as for power).

- C. Flush type power floor outlet.
 - 1. Fully adjustable pressed steel floor box with 20 amp, 120 volt grounding type duplex receptacle, Hubbell B2529.
 - 2. Flush cover for duplex receptacle: Brass flush cover suitable for floor box with flap opening. Provide brass carpet (linoleum) (terrazzo) rings.
- D. Flush type telephone floor outlet.
 - 1. Fully adjustable pressed steel floor box, Hubbell B-2529. Provide brass flush telephone cover with brass plug, and brass carpet (linoleum) (terrazzo) ring.
- E. Fire rated poke-through outlets.
 - 1. Power: Brushed aluminum cast housing, stainless cover plates, two 20 amp duplex receptacles, Hubbell PT7PP2.
 - 2. Telephone: Brushed aluminum cast housing with stainless cover plate, Hubbell PT7TT.
- F. Floor fittings - Size for depth of floor pour. Submit product data for approval.

2.12 OUTLET BOXES

- A. Outlet boxes and covers shall be pressed steel, except as noted, and protected against corrosion with zinc applied by the electric galvanizing, hot dipping or sheradizing process.
- B. Outlet boxes shall be of sizes and type to accommodate:
 - 1. Structural conditions.
 - 2. Size and number of raceways and conductors or cable entering.
 - 3. Device or fixture for which required.
- C. Outside lighting outlets shall have galvanized or cadmium plated cast iron boxes with gaskets, drilled and tapped to take fixture specified for these locations.
- D. Floor boxes where shown on plans shall be adjustable, watertight, cast iron, with brass cover and flange to match floor finish. Box shall be drilled and tapped to accommodate entering conduits and furnished with power or low tension pedestal head as indicated. Furnish in Steel City, National or equal.
- E. Cast Boxes: Cast fer alloy, deep type, gasketed cover, threaded hubs.

2.13 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: ANSI/NEMA OS 1; galvanized steel.
- B. Sheet Metal Boxes larger than 12 Inches in any Dimension to be hinged enclosure. Cast.

- C. Metal Boxes for Outdoor and Wet Location Installations: NEMA 250; Type 4 and Type 6, flat-flanged, surface-mounted junction box, UL listed as raintight. Galvanized cast iron box and cover with ground flange, neoprene gasket, and stainless steel cover screws.

2.14 BOXES AND FITTINGS

- A. Outlet boxes and fittings shall be installed at each outlet switch or junction point of conduit.
- B. Outlet boxes shall be as manufactured by Steel City, National or Raco.

2.15 HINGED COVER ENCLOSURES

- A. Construction: NEMA 250; Type (1) (3R) (4) steel.
- B. Finish: Manufacturer's standard enamel finish.
- C. Covers: Continuous hinge, held closed by flush latch operable by key.
- D. Panel for Mounting Terminal Blocks or Electrical Components: 14 gage steel, white enamel finish.

2.16 CABINETS

- A. Cabinet Boxes: Galvanized Steel with removable endwalls. Provide 3/4 inch thick plywood backboard painted matte white, for mounting terminal blocks.
- B. Cabinet Fronts: Steel, flush surface type with concealed hinge and flush lock keyed to match branch circuit panelboard; finish in gray baked enamel.

2.17 TERMINAL BLOCKS AND ACCESSORIES

- A. Terminal Blocks: ANSI/NEMA ICS 4; UL listed.
- B. Power Terminals: Unit construction type, closed-back type, with tubular pressure screw connectors, rated 600 volts.
- C. Signal and Control Terminals: Modular construction type, channel mounted; tubular pressure screw connectors, rated 300 volts.

2.18 FABRICATION

- A. Shop assemble enclosures and cabinets housing terminal blocks or electrical components in accordance with ANSI/NEMA ICS 6.
- B. Provide conduit hubs on enclosures.
- C. Provide protective pocket inside front cover with schematic diagram, connection diagram,

and layout drawing of control wiring and components within enclosure.

2.19 ELECTRICAL IDENTIFICATION

- A. Nameplates: Engraved three-layer laminated plastic, black letters on white background.
- B. Tape Labels: Embossed adhesive tape will not be permitted for any application.
- C. Wire and Cable Marker: Cloth markers, split sleeve or tubing type.

2.20 TOUCH-UP PAINT

- A. For Equipment: Provided by equipment manufacturer and selected to match equipment finish.
- B. For Non equipment Surfaces: Matching type and color of undamaged, existing adjacent finish.
- C. For Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION REQUIREMENTS

- D. Install components and equipment to provide the maximum possible headroom where mounting heights or other location criteria are not indicated.
- E. Install items level, plumb, and parallel and perpendicular to other building systems and components, except where otherwise indicated.
- F. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- G. Give right of way to raceways and piping systems installed at a required slope.

3.2 ELECTRICAL SUPPORTING METHODS

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- B. Dry Locations: Steel materials.
- C. Conform to manufacturer's recommendations for selecting supports.
- D. Strength of Supports: Adequate to carry all present and future loads, times a safety factor of at least 4; 200 lb-minimum design load.

3.3 SEISMIC BRACING

- A. Provide lateral bracing in all directions for all conduit and equipment, sufficient to resist the lateral forces determined under Connecticut Building Code, Section 1610.6.4 (BOCA 1996 as amended).
- B. Bracing calculations shall be based on Seismic Hazard Group I.
- C. A separate calculation shall be made for each equipment item.
- D. Provide bracing for all suspended or base mounted conduit and equipment except as excluded in Table 1610.6.4(1) of the Code.
- E. Attachments to building elements shall only be made at locations having sufficient strength and rigidity to absorb the forces calculated.
- F. For suspended equipment provide bracing such that the effectiveness of the equipment vibration isolators is not reduced.
- G. Vibration isolators, where called for, shall have sufficient lateral stability to resist the forces involved.
- H. Base mounted equipment attached directly to the structure, or on foundation or housekeeping pads, shall be provided with anchor bolts having sufficient strength in shear to absorb the calculated lateral forces in all directions.
- I. Isolated, base mounted equipment shall, in addition to verification of anchor bolt strength, have isolation having lateral stability and snubbing capacity to absorb the calculated lateral forces in all directions.
- J. Locate and install bracing so that access to the equipment for service, maintenance and repair will not be impeded. Bracing shall be arranged so that there will be no impediment to removal or replacement of the entire unit or piece of equipment

3.4 CONCRETE BASES

- A. Unless otherwise specifically noted, the Contractor shall furnish all necessary supports, pads, bases and piers required for all equipment furnished under the Division.
- B. Concrete pads are per the Division 3 Specification for switchboards, generators, motor control centers and other freestanding equipment. All pads extend six (6") inches beyond machine base in all directions with top edge chamfered. Insert steel dowel rods into floors to seismically anchor pads. Submit shop drawings of all foundations and pads to the Engineer for review before they are constructed. Field coordinate all required dimensional and necessary loading information.
- C. Construction of foundations, supports, pads, bases and piers where mounted on the floor is of the same finish quality as the adjacent and surrounding flooring material.

- D. Securely attach all equipment, unless otherwise shown, to the building structure in an acceptable manner. Attachments are of a strong and durable nature; replace any attachments that are insufficient, in the opinion of the Engineer, as directed without additional expense to the Owner.

3.5 INSTALLATION

- A. Install wires in raceway according to manufacturer's written instructions and NECA's "Standard of Installation."
- B. Connect outlets and components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including, screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.
- C. Install devices to securely and permanently fasten and support electrical components.
- D. Raceway Supports: Comply with NFPA 70 and the following requirements:
 - 1. Conform to manufacturer's recommendation for selecting and installing supports.
 - 2. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
 - 3. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
 - 4. Spare Capacity: Size supports for multiple conduits so capacity can be increased by a 25 percent minimum in the future.
 - 5. Support individual horizontal raceways with separate, malleable iron pipe hangers or clamps.
 - 6. Hanger Rods: 1/4-inch diameter or larger threaded steel, except as otherwise indicated.
 - 7. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports, with no weight load on raceway terminals.
- E. 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.
- F. Provide all conduits passing through floors, walls or partitions with sleeves having an internal diameter of one (1") inch larger than the outside diameter of the conduit or insulation enclosing the conduit.
- G. Solidly fill with mineral fiber or other acceptable fire-stopping material all penetrations through fire-rated walls, ceilings and all floors except slab on grade) in which conduits, cables or busways pass.

- H. Refer to Division 7 Specification for additional and more specific fire-stopping information.
- I. Submit fire-stopping systems as a shop drawing.
- J. Seal with a UL approved fire-stop fitting classified to an hourly rating equivalent to the fire rating of the wall, ceiling or floor all penetrations through fire-rated walls, ceiling or floors in which cables or conduits pass.
- K. Install seal fittings on conduits and cables, as required by the NEC, which are in or pass through hazardous areas.
- L. Use sealing bushings on conduit and cable ends to effectively prevent the intrusion of water, a damp or corrosive atmosphere, hot or cold air, or dust.
- M. Use thruwall and floor seals to provide a positive means of sealing pipes or conduits which pass through the concrete foundation of a structure below grade or below ground water level. Also use seals at entry points through concrete walls or floors which must be sealed.

3.6 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for electrical installations. Perform cutting by skilled mechanics of the trades involved.
- B. Repair disturbed surfaces to match adjacent undisturbed surfaces.
- C. Contractor is responsible for carrying out the requirements of this section at no additional costs to Owner. Costs of defective, conflicting, ill-timed work, or unnecessary cutting, coring, patching, and repairing are the sole responsibility of the Contractor.
- D. Provide cutting and patching per Division 1 requirements. Furnish sketches showing the location and sizes of all openings, chases, etc., required for the installation of Work.
- E. Furnish, locate and set inserts and/or sleeves as required before the floors and walls are built. The Contractor is responsible for the cost of drilling, cutting and patching as required for conduits, etc., where sleeves and inserts were not installed or correctly located. Provide all drilling required for the installation of hangers.
- F. Use extreme caution when installing all holes cut through concrete slabs to avoid cutting or damaging structural members. Cuts no structural members or structural slabs/floors without the written acceptance of the Engineer. Cut structural steel members in a manner directly by the Engineer.

3.7 LOCATION OF OUTLETS

- A. Coordinate work with other trades so that exact roughing locations are available for all devices and equipment.
- B. Locations shown on drawings are subject to modification due to conditions arising during construction. Such changes shall be executed as part of the work of this Section. Verify

locations shown on drawings with Architect and/or Owner, correcting discrepancies as they arise, all at no additional cost to the Owner.

- C. Outlets in equipment spaces shall be roughed after final location of piping and equipment has been established.
- D. Dimensions scaled from Electrical or Mechanical Drawings shall not be relied on in locating outlets. Use only Architectural Drawings for the determination of measurement of work in the field.

3.8 DEVICE INSTALLATION

- A. Install wall switches 48 inches above floor, OFF position down.
- B. Install wall dimmers 48 inches above floor. Separate adjacent dimmers as instructed by manufacturer to prevent a requirement for derating of dimmers. Do not use common neutrals.
- C. Install convenience receptacles 18 inches above floor, 6 inches above counters grounding pole on bottom.
- D. Install specific-use receptacles at heights shown on Contract Drawings.
- E. Drill opening for poke-through fitting installation in accordance with manufacturer's instructions.
- F. Install decorative plates on switch, receptacle, and blank outlets in finished are areas, using jumbo size plates for outlets installed in masonry walls.
- G. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.
- H. Install devices and wall plates flush and level.
- I. Verify all mounting heights with architectural drawings.
- J. Coordinate device locations with architectural details.

3.9 COORDINATION OF BOX LOCATIONS

- A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.
- B. Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify location of boxes and outlets prior to rough-in.
- C. Locate and install boxes to allow access.
- D. Locate and install to maintain headroom and to present a neat appearance.

- E. Locate boxes in masonry walls to require minimum cutting. Coordinate masonry cutting to achieve neat openings for boxes.
- F. Provide knockout closures for unused openings.
- G. Support boxes independently of conduit except for cast boxes that are connected to two rigid metal conduits, both supported within 12 inches of box.
- H. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.
- I. Align wall-mounted outlet boxes for switches, and similar devices.
- J. Boxes shall set plumb and true in building surface and furnished with suitable plaster rings where so required.

3.10 PULL AND JUNCTION BOX INSTALLATION

- A. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.
- B. Support pull and junction boxes independent of conduit.

3.11 CABINET INSTALLATION

- A. Install cabinets and enclosures plumb; anchor securely to wall and structural supports at each corner, minimum.
- B. Provide accessory feet for free-standing equipment enclosures. Install trim plumb.

3.12 POWER SYSTEM GROUNDING

- A. Main Electrical Room Grounding Grid: Exoterically weld cable connections and connections to ground rods. From two points on ground grid, provide one No. 350 KCMIL insulated ground conductor in one inch conduit to main ground bus.
- B. Main Distribution System: From ground bus, provide one No. 350 KCMIL insulated (bare) ground conductor in one inch conduit to ground bus within switchgear, to neutral of switchgear, and to non-current carrying parts.
- C. Circuit Grounding: Install grounding bushings, grounding studs, and grounding jumpers at distribution centers pullboxes motor control centers panelboards.
- D. Bonding Jumpers: Provide green insulation, sized correlated with over-current device protecting the wire, attach to grounding bushings on conduit, to lugs on boxes and other enclosures. Connection to neutral only at service neutral bar make separate lug.
- E. Bonding Wire: Install bonding wire when using flexible conduit connected at each end to

a grounding bushing.

- F. Busduct Grounding: Ground busduct enclosure to main distribution center ground.
- G. Post Light Grounding: Provide direct-bury ground conductor with green insulation to lighting standards. Connect to corrosion-resistant ground stud or ground clamp to feed-in point ground.

3.13 COMMUNICATION GROUNDING

A. Telephone:

1. Provide one No. 2 TWH to ground bus in telephone equipment room.
2. Provide one No. 2 TWH to telephone service conduit.
3. Provide one No. 12 TWH to conduits terminating at backboard.

B. Fire Alarm and Detection:

1. Provide one No. 8 TWH in 1/2 inch conduit to nearest ground bus.

C. Television Distribution System:

1. Provide one No. 8 TWH in 1/2 inch conduit to nearest ground bus.

D. Public Address System:

1. Provide one No. 8 TWH in 1/2 inch conduit to nearest ground bus.

3.14 ELECTRICAL IDENTIFICATION INSTALLATION

A. Degrease and clean surfaces to receive nameplates.

B. Install nameplates parallel to equipment lines.

C. Secure nameplates to equipment fronts using screws, rivets, or adhesive. Secure nameplate to inside face of recessed panelboard doors in finished locations.

3.15 WIRE IDENTIFICATION

- A. Provide wire markers on each conductor in panelboard gutters, pull boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on equipment manufacturer's shop drawings for control wiring.

3.16 NAMEPLATE ENGRAVING SCHEDULE

- A. Provide nameplates of minimum letter height as scheduled below.

- B. Panelboards, Switchboards and Motor Control Centers: 1/4 inch; identify equipment designation. 1/8 inch; identify voltage rating and source.
- C. Individual Circuit Breakers, Switches, and Motor Starters in Panelboards, Switchboards, and Motor Control Centers: 1/8 inch; identify circuit and load served, including location.
- D. Individual Circuit Breakers, Enclosed Switches, and Motor Starters: 1/8 inch; identify load served.
- E. Transformers: 1/4 inch; identify equipment designation. 1/8 inch; identify primary and secondary voltages, primary source, and secondary load and location.
- F. Devices, provide 1/8 inch; on receptacles with circuit and panel number.

3.17 PANEL DIRECTORIES

- A. Provide neatly typed directory in door of each branch circuit panelboard identifying each circuit, its use, and breaker size. Prepare directory only after all circuit adjusting for phase balancing has been completed.
- B. Provide typed legend of circuits in each main circuit board and distribution panel.

3.18 TOUCHUP PAINTING

- A. Thoroughly clean damaged areas and provide primer, intermediate, and finish coats to suit the degree of damage at each location.
- B. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.

3.19 SHORT CIRCUIT ANALYSIS, COORDINATION STUDY AND TEST

- A. Provide a complete short circuit analysis of all nodes indicated on power riser diagram.
 - 1. Recommend appropriate AIC ratings for all electrical distribution equipment indicated on Power Riser diagrams.
 - 2. Series rating of equipment is not acceptable.
 - 3. Assume infinite bus on primary of utility transformer.
 - 4. Provide equipment with appropriate AIC ratings per recommendations as part of initial bid.
- B. Provide a complete coordination study of all three phase circuit breakers 100 Amperes or greater.
 - 1. Recommend appropriate trip settings for all adjustable trip circuit breakers and ground fault relays.
 - 2. Fault currents will be based on short circuit study above.
 - 3. Provide modifications to existing design in order to achieve complete selective

coordination of the entire system.

- C. Retain services of an independent testing agency to provide a complete bolted short selective coordination test of every fault path in the coordination study.
 - 1. Adjust trip settings on breakers as required to achieved selective coordination.
- D. Perform study before submission of shop drawings for review.

3.20 GROUNDING TEST

- A. Measure ground grid resistance with earth test megger and install additional ground rods and conductors as required until resistance to ground complies with Code requirements.

END OF SECTION 260605

SECTION 260519 - WIRE AND CABLE

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 WORK INCLUDED

- A. Building wire.
- B. Cable.
- C. Wiring connections and terminations.

1.3 RELATED WORK

- A. Section 260500 - General Provisions-Electrical.
- B. All other Sections of Division 26.

1.4 REFERENCES

- A. NEMA WC 3 - Rubber-insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
- B. NEMA WC 5 - Thermoplastic-insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
- C. NFPA 70 - 2014 -National Electrical Code.

1.5 SUBMITTALS

- A. Submit product data for Wire and Cable under provisions of Section 16010.

PART 2 - PRODUCTS

2.1 BUILDING WIRE

- A. Thermoplastic - insulated Building Wire: NEMA WC 5.
- B. Rubber-insulated Building Wire: NEMA WC 3.

- C. Feeders and Branch Circuits Larger Than 6 AWG; Copper, stranded conductor, 600 volt insulation, THW, THHN/THWN.
- D. Feeders and Branch Circuits 6 AWG and Smaller: Copper conductor, 600 volt insulation, THW OR THHN/THWN, 6 and 8 AWG, stranded conductor; smaller than 8 AWG, solid conductor.
- E. Control Circuits: Copper, stranded conductor 600 volt insulation, THW.
- F. Wire sizes #6 and larger shall be stranded. All sizes called for in the specifications or on the plans are American Wire Gauge sizes. Conductors shall be copper, unless noted differently.
- G. All wire shall be factory color-coded with a separate color for phase, switch and neutral used consistently throughout. The neutral wire of all branch circuits shall be white. Green shall be used for equipment grounding conductors. Feeders shall be phase color coded at all access points.
- H. The use of MC or SER cable for panel feeders is acceptable where concealed. Exposed feeders shall be run in EMT or RGC.
- I. The use of MC cable and NM cable is acceptable as required by code or as unless otherwise noted elsewhere. Where MC cable is permitted under this specification, its use shall be governed by Article 334 of the National Electric Code and approved by authorities having jurisdiction.
- J. Cables are required to be installed per NEC. All installation shall be coordinated with construction types and NEC requirements. Coordinate types of construction with Architectural plans and specifications. Install cables in conduit where required by NEC.
- K. Provide plenum rated cable where required. Coordinate with Div. 23.
- L. All wiring for branch circuits and grounding shall be provided and installed per NEC requirements. Any discrepancies to said requirements on drawings shall be verified during bid process with Engineer.

2.2 REMOTE CONTROL AND SIGNAL CABLE

- A. Control Cable for Class 1 Remote Control and Signal Circuits: Copper conductor, 600 volt insulation, rated 90 degree C. individual conductors twisted together, and covered with an overall PVC jacket.
- B. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, rated 90 degree C, individual conductors twisted together, and covered with a PVC jacket; UL listed.
- C. Section A & B above shall be installed in E.M.T.

PART 3 - EXECUTION

3.1 GENERAL WIRING METHODS

- A. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 14 AWG for control wiring.
- B. Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75 feet, and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet.
- C. Place an equal number of conductors for each phase of a circuit in same raceway or cable.
- D. Splice only in junction or outlet boxes.
- E. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- F. Make Conductor lengths for parallel circuits equal.
- G. All wires and cables shall be continuous from origin to destination without running splices. At the end of these wires and cables, a sufficient slack shall be left as may be required for making proper connections.
- H. No grease or other component which contains acids shall be used in pulling wires and cables.
- I. Where solid conductors are to be connected directly to the devices without the use of lugs, such as occurs at lighting switches and plug receptacles, the wire shall be formed into a loop to fit around the screw.

3.2 WIRING INSTALLATION IN RACEWAYS

- A. Pull all conductors into a raceway at the same time. Use UL listed wire pulling lubricate for pulling 4 AWG and larger wires.
- B. Install wire in raceway after all mechanical work likely to injure conductors has been completed.
- C. Completely and thoroughly swab raceway system before installing conductors.

3.3 CABLE INSTALLATION

- A. Provide protection for exposed cables where subject to damage.
- B. Support cables above accessible ceilings do not rest on ceiling tiles. Use spring metal clips or cable ties to support cables from structure. Include bridle rings or drive rings.

- C. Use suitable cable fittings and connectors.
- D. Use solderless pressure connectors with insulating covers for copper wire splices and taps, 8 AWG and smaller. For 10 AWG and smaller, use insulated spring wire connectors with plastic caps.
- E. Use split bolt connectors for copper wire splices and taps, 6 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor.
- F. Thoroughly clean wires before installing lugs and connectors.
- G. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.
- H. Terminate spare conductors with electrical tape.

3.4 FIELD QUALITY CONTROL

- A. Inspect wire and cable for physical damage and proper connection.
- B. Torque test conductor connections and terminations to manufacturer's recommended values.
- C. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.
- D. Conduits must be swabbed out and made thoroughly dry before pulling wire and cable.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section includes grounding of electrical and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Data: For the following:
 - 1. Ground rods.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- D. Field Test Reports: Submit written test reports to include the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - 1. Comply with UL 467.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Grounding Conductors, Cables, Connectors, and Rods:
 - a. Erico Inc.; Electrical Products Group
 - b. Ideal Industries, Inc.
 - c. O-Z/Gedney Co.; a business of the EGS Electrical Group.
 - d. Raco, Inc.; Division of Hubbell
 - e. Thomas & Betts, Electrical
 - f. Burndy Electrical.

2.2 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Division 26 Section "Conductors and Cables."
- B. Equipment Grounding Conductors: Insulated with green-colored insulation.
- C. Isolated Ground Conductors: Insulated with green-colored insulation.
- D. Grounding Electrode Conductors: Stranded cable.
- E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- F. Bare Copper Conductors: Comply with the following:
 1. Solid Conductors: ASTM B3.
 2. Assembly of Stranded Conductors: ASTM B8.
 3. Tinned Conductors: ASTM B 33.
- G. Copper Bonding Conductors: As follows:
 1. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor, unless indicated otherwise.
 2. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1 5/8 inches wide and 1/16 inch thick (or as shown on the drawings).
- H. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators with pre-drilled and tapped holes in NEMA configuration.

2.3 CONNECTOR PRODUCTS

- A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combination of conductors and connected items.
- B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.
- C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.4 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel.
 - 1. Size: 3/4 by 120 inches.

PART 3 - EXECUTION

3.1 APPLICATION

- A. In raceways, use insulated equipment grounding connectors.
- B. Equipment Grounding Conductor Terminations: Use bolted pressure clamps with at least two bolts.
- C. Ground Rod Clamps at Test Wells: Use bolted pressure clamps.
- D. Grounding Bus: Install in electrical, telephone, CATV and data equipment rooms, and closets, and elsewhere as indicated.
 - 1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.
 - 2. Length: 24 inches, unless noted otherwise.
- F. Underground Grounding Conductors: Use tinned-copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade or bury 12 inches above duct bank when installed as part of the duct bank.

3.2 EQUIPMENT GROUNDING CONDUCTORS

- A. Comply with 2014 NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
- B. Install equipment grounding conductors in all feeders and circuits.
- C. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - 1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-24-inch grounding bus.
 - 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- D. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit

conductors.

- E. CSST gas piping systems shall be bonded to the electrical service grounding electrode system at the point where the gas service enters the building. The bonding jumper shall not be smaller than 6 AWG copper wire. Coordinate with Div. 15.

3.3 COUNTERPOISE

- A. Ground the steel framework of the building with a driven ground rod at the base of every corner column and at intermediate exterior columns at distances not more than 60 feet apart. Provide a grounding conductor (counterpoise), electrically connected to each ground rod and to each steel column, extending around the perimeter of the building. Use tinned-copper conductor not less than No. 500 MCM AWG for counterpoise and for tap to building steel. Bury counterpoise not less than 18 inches below grade and 24 inches from building foundation.

3.4 INSTALLATION

- A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
 - 1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
 - 2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.
- B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
- D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
- E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.

- F. Install one test well for each service at the ground rod electrically closet to the service entrance. Set top of well flush with finished grade or floor.

3.5 CONNECTIONS

- A. General: Make connection so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections have dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
- E. Connections at Test Wells: Use compression-type connectors make bolted-and clamped-type connections between conductors and ground rods.
- F. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
- G. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
- H. Moisture Protection: If insulated grounding conductors are connected to ground rods or

grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.6 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

- A. Manholes and Handholes: Install a driven ground rod close to wall and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.
- B. Connections to Manhole Components: Connect exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

3.7 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing:
 - 1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
 - 2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
 - 3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
 - a. Equipment Rated 500 kVA and Less: 10 ohms.
 - b. Equipment Rated 500 to 1000 kVA: 5 ohms.
 - c. Equipment Rated More Than 1000 kVA: 3 ohms.
 - d. Manhole Grounds: 10 ohms.
 - 4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260525

SECTION 260529 - HANGERS AND SUPPORTS

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 WORK INCLUDED

- A. Conduit and equipment supports.
- B. Fastening hardware.

1.3 RELATED WORK

- A. Section 260500 - General Provisions-Electrical.
- B. All other Sections of Division 26.

1.4 REFERENCES

- A. NFPA 70 - 2014 - National Electrical Code.

1.5 QUALITY ASSURANCE

- A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Support Channel: Galvanized or painted steel.
- B. Hardware: Corrosion resistant.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using precast insert system, expansion anchors, preset inserts or beam clamps.
- B. Use expansion anchors or preset inserts in solid masonry walls, self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.
- C. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.
- D. Do not use powder-actuated anchors.
- E. Do not drill structural steel or concrete members.
- F. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- G. In wet locations install free-standing electrical equipment on concrete pads.
- H. Install surface-mounted cabinets and panelboards with minimum of four anchors. Provide steel channel supports to stand cabinet one inch off wall.
- I. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.

3.2 HANGERS AND ATTACHMENTS

- A. In general, the following methods of fastening of supports to building structure shall be used.
 - 1. Bolts and expansion shields to be used in concrete slabs where weight does not exceed 100 pounds per fastening.
 - 2. Inserts to be used in lightweight concrete structural slabs where weight does not exceed 300 pounds per fastening.
 - 3. Inserts to be used in heavyweight concrete structural slabs where weight does not exceed 500 pounds per fastening.
 - 4. Where the aforementioned fastening methods are not applicable or where inserts have for any reason not been provided, supply a steel fishplate (1/4" thick with area required) with thru-bolt for each fastening. Fishplate assembly shall be chased into

slab and grouted flush with top of slab.

- B. Provide such channel or angle iron members as may be necessary to bridge between structural steel and receive supports for fastening. Such auxiliary steel shall be welded to the structural steel.
- C. Supporting racks of angle iron, flat iron and channel iron members shall be provided for electrical work indicated as being supported from walls where such walls are found to be incapable of supporting the weight.
 - 1. Where provided, supporting racks shall be rigidly bolted or welded together and adequately braced to provide a substantial structure. Racks shall be of ample size to provide for a workmanlike arrangement of all equipment thereon.
- D. No metal enclosures of equipment, etc. for surface installation shall be mounted directly on any wall. Provide flat bar members for a minimum of 1/4" space between the wall and metal enclosure shall be installed.

END OF SECTION 260529

SECTION 260533 - CONDUIT

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 WORK INCLUDED

- A. Rigid metal conduit and fittings.
- B. Intermediate metal conduit (IMC) and fittings.
- C. Electric metallic tube (EMT) and fittings.
- D. Liquidtight flexible metal conduit and fittings.
- E. Surface metal raceways.

1.3 RELATED WORK

- A. Section 260500 - General Provisions-Electrical.
- B. All other Sections of Division 26.

1.4 REFERENCES

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated.
- B. ANSI C80.3 - Electrical Metallic Tubing, Zinc-Coated.
- C. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
- D. FS WW-C-563 - Electrical Metallic Tubing.
- E. FS WW-C-566 - Specification for Flexible Metal Conduit.
- F. FS WW-C-581 - Specification for Galvanized Rigid Conduit.

PART 2 - PRODUCTS

2.1 RIGID METAL CONDUIT AND FITTINGS

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; threaded type, material to match conduit.

2.2 INTERMEDIATE METAL CONDUIT (IMC) AND FITTINGS

- A. Conduit: Galvanized steel.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; use fittings and conduit bodies specified above for rigid steel conduit.

2.3 ELECTRICAL METALLIC TUBING (EMT)

- A. Electrical Metallic Tubing.
- B. Fittings and Conduit Bodies: Material to Match.

2.4 LIQUIDTIGHT FLEXIBLE CONDUIT AND FITTINGS

- A. Conduit: Flexible metal conduit with PVC jacket.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1.

2.5 SURFACE METAL RACEWAYS

- A. As manufactured by Wiremold, Inc., type and size as indicated on Drawings.

2.6 CONDUIT SUPPORTS

- A. Conduit Clamps, Straps, and Supports: Steel or malleable iron. Refer to Section 260505.

2.7 APPROVED MANUFACTURERS

- A. Rigid steel threaded conduit shall be as manufactured by one of the following:
 - 1. Wheatland Tube Company.
 - 2. Youngstown Sheet and Tube Company.
 - 3. Republic Steel Corporation.
 - 4. Triangle.
- B. Electrical metallic tubing shall be steel, electrically welded and galvanized, and shall be as manufactured by one of the following:

1. Youngstown Sheet and Tube Company.
 2. Republic Steel Corporation.
 3. Wheatland Tube Company.
- C. Couplings and box connectors shall be concrete-tight, set screw type as manufactured by one of the following:
1. Raco, Inc.
 2. Appleton electric Company.
 3. Efcor Div.
- D. Furnish and install where indicated on drawings steel surface metal raceways and wireways as manufactured by:
1. Wiremold Company.
 2. Siemens.
 3. Columbia Metal Products.
- E. Flexible steel conduit shall have an integral bond wire for grounding and shall be as manufactured by Sealtite, American Flexible Conduit Company, or Triangle/pwc. Liquid-tight flexible conduit shall be used where flexibility and protection from liquids, vapors, or solids is needed.
- F. Aluminum conduit and fittings will not be allowed unless specifically noted on drawings.

PART 3 - EXECUTION

3.1 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

- A. Size conduit for conductor type and number installed, 3/4 inch minimum size.
- B. Arrange conduit to maintain headroom and present a neat appearance.
- C. Route exposed conduit and conduit above accessible ceilings, parallel and perpendicular to walls and adjacent piping.
- D. Maintain minimum 6 inch clearance between conduit and piping. Maintain 12 inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.
- E. Arrange conduit supports to prevent distortion or alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.
- F. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.

- G. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.
- H. Support conduit per Article 352 of the National Electrical Code, 2014, (NFPA-70-2014).
- I. All conduits and cable assemblies are to be concealed unless otherwise noted.

3.2 CONDUIT INSTALLATION

- A. Cut conduit square using a saw or pipe cutter; de-burr cut ends.
- B. Bring conduit to the shoulder of fittings and couplings and fasten securely.
- C. Use conduit hubs or sealing locknuts for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations.
- D. Install no more than the equivalent of four 90-degree bends between boxes.
- E. Use conduit fittings to make sharp changes in direction, as around beams.
- F. Use hydraulic bender or factory elbows for bends in conduit larger than 2 inch size.
- G. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point, all underground conduits shall be water tight to prevent the entrance of subsurface water into the building.
- H. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.
- I. Provide No. 12 AWG insulated conductor or suitable pull string in empty conduit, except sleeves and nipples.
- J. Install expansion joints where conduit crosses building expansion joints.
- K. Where conduit penetrates fire-rated walls and floors, provide mechanical firestop fittings with UL listed fire rating equal to wall or floor rating.

3.3 CONTINUITY

- A. Complete raceway systems shall become metallically continuous and shall be thoroughly grounded in accordance with requirements of the National Electrical Code, 2014 and its latest revisions.

3.4 CONDUIT/RACEWAY SCHEDULE

- A. Wet Interior Locations: Rigid steel.
- B. Dry Concealed Locations: EMT.
- C. Dry Exposed Locations: Rigid steel or IMT, surface metal raceways.

- D. Connections to Transformers and Machinery: 24" Minimum length Sealtite Flexible Conduit.
- E. Below Grade, Below or In Slabs: Rigid steel.

3.5 PVC CONDUITS

- A. Where indicated on Drawings, raceways may be Schedule 40 or Schedule 80 PVC, complete with compatible fittings.
- B. All PVC conduit runs must be electrically continuous using a separate grounding conductor in addition to the conductors specified for the run.

END OF SECTION 260533

SECTION 260548 - SEISMIC BRACING

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 WORK INCLUDED

- A. Lateral seismic bracing for all conduits and equipment, suspended or base mounted.
- B. Include calculations, attachments, bracing members.

1.3 RELATED SECTIONS

- A. Section 260500 - General Provisions-Electrical.
- B. All other Sections of Division 26.

1.4 REFERENCES

- A. Connecticut State Building Code 2016.
- B. NFPA 70 - 2014 National Electrical Code.

1.5 SUBMITTALS

- A. Submit sketches of proposed bracing systems for suspended equipment, including loads, etc.
- B. Provide documentation that vibration isolators and anchor bolts will have properties sufficient to withstand required forces.
- C. Sketches and calculations submittals shall bear the seal and signature of a structural engineer licensed in the State of Connecticut.

1.6 COORDINATION

- A. Coordinate bracing design and installation with work of other Sections.
- B. Bracing schemes may be jointly reviewed by Electrical and Structural Engineer and Architect. Provide whatever detail is required by each.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Bracing shall be fabricated from standard structural or trade sections.
- B. Attachments to masonry walls shall be by means of expansion shields and bolts.
- C. Attachment to building structure shall meet approval of Structural Engineer.

PART 3 - EXECUTION

3.1 PROCEDURE

- A. Provide lateral bracing in all directions for all equipment, piping, ductwork, etc., sufficient to resist the lateral forces determined under Connecticut Building Code.
- B. Bracing calculations shall be based on a **Seismic Hazard Exposure Group II** and a **Seismic Performance Category C**, using the following factors:
 - a. Peak Velocity-Related Acceleration (A_v): 0.13
 - b. Seismic Coefficient (C_s)
 - Emergency and Fire Protection Systems: 2.0
 - Communication systems, bus ducts, primary systems: 2.0
 - All Equipment base mounted, suspended, or attached to building and transformer: 2.0
 - Panelboards and lighting fixtures: 0.67
 - Pendant mounted fixtures: 1.5
 - c. Performance Criteria Factor (P):
 - Emergency and Fire Protection Systems: 1.5
 - Communication systems, bus ducts, primary systems: 1.0
 - All Equipment base mounted, suspended, or attached to building and transformer: 1.0
 - Panelboards and lighting fixtures: 1.0
 - Pendant mounted fixtures: 1.0
 - d. Attachment Amplification Factor (a_c): 2.0
 - e. Operating Weight of Equipment (W_p): As required
- C. Conduit less than 2-1/2 inches need not be seismically braced. Conduit installed within 12 inches from the top of conduit to the supporting building member need not be braced.
- D. The vertical support for a pendant mounted fixture shall have a safety factor of 4.0.
- E. The force calculated shall be applied at the center of gravity of the component nonconcurrently in a horizontal direction. Attachments shall be by positive connection, frictional forces shall be neglected.
- F. A separate calculation shall be made for each equipment item.

- G. Provide bracing for all suspended and/or base mounted equipment and conduit, except as excluded under the Code..
- H. Attachments to building elements shall only be made at locations having sufficient strength and rigidity to absorb the forces calculated.

3.2 SUSPENDED EQUIPMENT

- A. Provide bracing such that the effectiveness of equipment vibration isolators is not reduced.
- B. Vibration isolators, where called for, shall have sufficient lateral stability to resist the forces involved.

3.3 BASE MOUNTED EQUIPMENT

- A. Equipment attached directly to the structure, or on foundation or housekeeping pads, shall be provided with anchor bolts having sufficient strength in shear to absorb the calculated lateral forces in all directions.
- B. Isolated, base mounted equipment shall, in addition to verification of anchor bolt strength, have isolation having lateral stability and snubbing capacity to absorb the calculated lateral forces in all directions.

3.4 CONDUIT BRACING

- A. As defined under 3.1 above.

3.5 ESSENTIAL EQUIPMENT

- A. Essential building equipment including, but not limited to, emergency power and lighting systems, fire protection systems, shall be braced as provided for above, except that the force calculations shall use a Seismic Coefficient of 2.0 and a Performance Criteria factor of 1.5.

3.6 FABRICATION AND INSTALLATION

- A. Fabricate from standard materials.
- B. Locate and install bracing so that access to the equipment for service, maintenance and repair will not be impeded. Bracing shall be arranged so that there will be no impediment to removal or replacement of the entire unit or piece of equipment.

END OF SECTION 260548

SECTION 260553 - ELECTRICAL IDENTIFICATION

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 WORK INCLUDED

- A. Nameplates and tape labels.
- B. Wire and cable markers.
- C. Panelboard Directories

1.3 RELATED WORK

- A. Section 260500 - General Provisions - Electrical.
- B. All other Sections of Division 26.

1.4 REFERENCES

- A. NFPA 70 - 2014 - National Electrical Code.

1.5 SUBMITTALS

- A. Submit shop drawings in accordance with requirements of Section 16010.
- B. Include schedule for nameplates and tape labels.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Nameplates: Engraved three-layer laminated plastic, black letters on white background.
- B. Tape Labels: Embossed adhesive tape will not be permitted for any application.
- C. Wire and Cable Marker: Cloth markers, split sleeve or tubing type.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Degrease and clean surfaces to receive nameplates.
- B. Install nameplates parallel to equipment lines.
- C. Secure nameplates to equipment fronts using screws, rivets, or adhesive. Secure nameplate to inside face of recessed panelboard doors in finished locations.

3.2 WIRE IDENTIFICATION

- A. Provide wire markers on each conductor in panelboard gutters, pull boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on equipment manufacturer's shop drawings for control wiring.

3.3 NAMEPLATE ENGRAVING SCHEDULE

- A. Provide nameplates of minimum letter height as scheduled below.
- B. Panelboards, Switchboards and Motor Control Centers: 1/4 inch; identify equipment designation. 1/8 inch; identify voltage rating and source.
- C. Individual Circuit Breakers, Switches, and Motor Starters in Panelboards, Switchboards, and Motor Control Centers: 1/8 inch; identify circuit and load served, including location.
- D. Individual Circuit Breakers, Enclosed Switches, and Motor Starters: 1/8 inch; identify load served.
- E. Transformers: 1/4 inch; identify equipment designation. 1/8 inch; identify primary and secondary voltages, primary source, and secondary load and location.
- F. Devices, provide 1/8 inch; on receptacles with circuit and panel number.

3.4 PANEL DIRECTORIES

- A. Provide neatly typed directory in door of each branch circuit panelboard identifying each circuit, its use, and breaker size. Prepare directory only after all circuit adjusting for phase balancing has been completed.
- B. Provide typed legend of circuits in each main circuit board and distribution panel.

END OF SECTION 260553

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK INCLUDED

- A. Branch circuit panelboards.

1.3 RELATED WORK

- A. Section 260500- General Provisions-Electrical.
- B. All other Sections of Division 26.

1.4 REGULATORY REQUIREMENTS

- A. National Electrical Code-2014.
- B. National Electrical Manufacturers Association-1999.
- C. National Fire Protection Association-(NFPA 101 with Appendix, 1997) .
- D. Construct panelboards to UL standards and provide UL labels.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Eaton Corp.; Cutler-Hammer Products.
- B. General Electric Co.; Electrical Distribution & Control Div.
- C. Siemens Energy & Automation, Inc.
- D. Square D. Co.

2.2 ENCLOSURES

- A. Panels: Surface or flush mounted complete with panel trim having concealed hinges and trim mounting screws. Provide locking door with flush catch.

- B. Tube: Galvanized.
- C. Keys: Provide two keys for each panel. Make keys interchangeable for panels of same voltage.

2.3 120/208 VOLT PANELBOARDS

- A. Panelboards: 3 phase, 4 wire, solid neutral design with sequence style bussing and full capacity neutral, composed of an assembly of bolt-in-place molded case automatic circuit breakers with thermal and magnetic trip and trip free position separate from either ON or OFF positions. Provide common simultaneous trip for 2 and 3 pole breakers. Provide interrupting ratings of 22,000 AIC for 208 volts.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide mounting brackets, busbar drilling, and filler pieces for unused spaces.
- B. Prepare and affix typewritten directory to inside cover of panelboard indicating loads controlled by each circuit.
- C. Provide breaker for elevator shunt trip.

END OF SECTION 262416

SECTION 262726 - ELECTRICAL DEVICES

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 WORK INCLUDED

- A. Provide, where indicated, specification grade, Underwriters' Laboratories listed, wiring devices.
- B. Furnish all power outlets other than standard duplex receptacles with a matching male cap.
- C. Devices:
 - 1. Wall Switches
 - 2. Receptacles (Standard, Isolated Ground and GFCI Type)
 - 4. Face Plates
 - 5. Wall Dimmer
 - 6. Timer Switches
 - 7. Floor mounted devices

1.3 RELATED WORK

- A. Section 260500- General Provisions-Electrical.
- B. All other Sections of Division 26.

1.4 SUBMITTALS

- A. Submit product data under provisions of Section 260500.
- B. Provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

PART 2 - PRODUCTS

2.1 WALL SWITCHES

- A. Acceptable Manufacturers:
 - 1. Hubbell
 - 2. Leviton
 - 3. Arrow-Hart

- B. 20 Amp - 1P, Hubbell #1221-I.
- C. 20 Amp - 2P, Hubbell #1222-I.
- D. 20 Amp - 3-Way, Hubbell #1223-I.
- E. 20 Amp - 4-Way, Hubbell #1224-I
- F. 20 Amp - With Pilot Light, Hubbell #1221-IL.

2.2 RECEPTACLES

- A. Acceptable Manufacturers:
 - 1. Hubbell
 - 2. Leviton
 - 3. Arrow-Hart
- B. Specification Grade, Straight Blade Duplex Receptacle (Hubbell 5362-Ivory or equal)
 - 1. Rating: 125 Volt - 20 Amp
 - 2. Poles and Wires: 2 Pole, 3 Wire, Grounding
 - 3. Nema Type: 5-20R
- C. Specification Grade, Straight Blade Duplex Receptacle with **Isolated Ground** (Hubbell IG5362-Orange or equal)
 - 1. Rating: 125 Volt - 20 Amp
 - 2. Poles and Wires: 2 Pole, 3 Wire, Grounding
 - 3. Nema Type: 5-20R
- D. Specification Grade, Straight Blade, Duplex, **GFCI** Receptacle (Hubbell GFR5352-Ivory or equal)
 - 1. Rating: 125 Volt - 20 Amp
 - 2. Poles and Wires: 2 Pole, 3 Wire, Grounding
 - 3. Nema Type: 5-20R
- E. Specification Grade, Straight Blade, Duplex, **Tamper Resistant Arc Fault** Receptacle (Hubbell AFR20TRI-Ivory or equal)
 - 1. Rating: 125 Volt - 20 Amp
 - 2. Poles and Wires: 2 Pole, 3 Wire
 - 3. Nema Type: 5-20R

2.3 FACEPLATES

- A. Wall Switch Face Plates (With the required number of gangs)
 - 1. Smooth thermoplastic (Ivory) (Brown) (Gray) (White) (Black) (Red).
 - 2. Satin finish stainless
 - 3. Wet Location (Hubbell 1795 or equal)

- B. Receptacle Face Plates (With the required number of gangs)
 - 1. Smooth thermoplastic (Ivory) (Brown) (Gray) (White) (Black) (Red).
 - 2. Satin finish stainless
 - 3. Wet Location (Hubbell WP8M or equal)

2.4 TIMERS

- A. Mark Time Catalogue M9006 - 30 Minute Off.

2.5 DIMMERS

- A. Incandescent 600W to 1000W, Lutron N-1000.
- B. Fluorescent: Two (2) to twenty (20) 40 watt lamps, Lutron FD-20 (I20) (277).
- C. Matching faceplates by Lutron.
- D. Fluorescent dimmer ballasts to be as required by dimmer manufacturer.
- E. Rating: Sizes listed are minimum, larger size to accommodate load shown on Contract Drawings.
- F. Dimmer Boxes: Size as required by dimmer manufacturer and space to avoid derating of dimmer, or break-off of faceplate cooling fins.

2.6 FLOOR TYPE SERVICE FITTINGS

- A. Above floor power service fitting for greater than 3 inch pour.
 - 1. Satin aluminum housing, 3/4 inch nipple, with stainless device plates and 20 amp duplex receptacle, Hubbell SC3091 for one receptacle and Hubbell SC3092 for two duplex receptacles back to back.
 - 2. Full adjustable stamped steel floor box for greater than 3" depth of pour, Hubbell B-2527 shallow (B-2536 deep) with S-2525 cover.
- B. Above floor telephone service fitting for greater than 3 inch pour.
 - 1. Satin aluminum housing, 3/4 inch nipple with stainless steel plate with brushed hole, Hubbell SC3190, (Hubbell 3192 back to back) with floor box (same as for power).
- C. Flush type power floor outlet.
 - 1. Fully adjustable pressed steel floor box with 20 amp, 120 volt grounding type duplex receptacle, Hubbell B2529.
 - 2. Flush cover for duplex receptacle: Brass flush cover suitable for floor box with flap

opening. Provide brass carpet (linoleum) (terrazzo) rings.

- D. Flush type telephone floor outlet.
 - 1. Fully adjustable pressed steel floor box, Hubbell B-2529. Provide brass flush telephone cover with brass plug, and brass carpet (linoleum) (terrazzo) ring.
- E. Fire rated poke-through outlets.
 - 1. Power: Brushed aluminum cast housing, stainless cover plates, two 20 amp duplex receptacles, Hubbell PT7PP2.
 - 2. Telephone: Brushed aluminum cast housing with stainless cover plate, Hubbell PT7TT.
- F. Floor fittings - Size for depth of floor pour. Submit product data for approval.
- G. Acceptable Manufacturers:
 - 1. Hubbell.
 - 2. Walker.
 - 3. Steel City.
 - 4. Substitutions: Under provisions of Section 01630.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install wall switches 48 inches above floor, OFF position down.
- B. Install wall dimmers 48 inches above floor. Separate adjacent dimmers as instructed by manufacturer to prevent a requirement for derating of dimmers. Do not use common neutrals.
- C. Install convenience receptacles 18 inches above floor, 6 inches above (counters) (backsplash) grounding pole on (top) (bottom).
- D. Install specific-use receptacles at heights shown on Contract Drawings.
- E. Drill opening for poke-through fitting installation in accordance with manufacturer's instructions.
- F. Install decorative plates on switch, receptacle, and blank outlets in finished areas, using jumbo size plates for outlets installed in masonry walls.
- G. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.

- H. Install devices and wall plates flush and level.
- I. Verify all mounting heights with architectural drawings.
- J. Coordinate device locations with architectural details.

END OF SECTION 262726

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 GENERAL

- A. All applicable provisions of the General Conditions, the Supplementary General Conditions and Division 1 shall apply to all work of this Section.

1.2 WORK INCLUDED

- A. Fuses.

1.3 RELATED WORK

- A. Section 260500 - General Provisions-Electrical.
- B. All other Sections of Division 26.

1.4 REFERENCES

- A. NFPA 70 - 2014 - National Electrical Code.

1.5 SUBMITTALS

- A. Submit product data for all fuses.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Bussmann Fuse Company.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All fuses shall be of the same manufacturer, and shall be furnished and installed by this Division in all motor starters, cutouts, switches, and where shown on the Contract Drawings.
- B. In the event the electrical contractor wishes to furnish materials other than those specified, a written request, along with a computer generated short circuit and selective coordination study, shall be submitted to the Engineer for evaluation at least two weeks prior to bid date. Lack of request will indicate that the contractor shall submit fuses as specified.

- C. Fuses shall not be installed until equipment is ready to be energized. All fuses shall be furnished and installed by this Division.
- D. Mains, Feeders and Branch Circuits:
1. Circuits 601 to 6000 ampere shall be protected by current limiting Bussmann Low Peak Time-Delay Fuses KRP-C. Fuses shall employ "O" rings as positive seals between the end bells and the glass melamine fuse barrel. Fuse links shall be pure silver links (99.9% pure) to limit the short circuit current let-thru values to low levels and comply with NEC Sections requiring component protection. The terminals shall be peened. Fuses shall be time-delay and must hold 500% of rated current for a minimum of 4 seconds, clear 20 times rated current in .01 seconds or less and be listed by Underwriters Laboratories, Inc., with an interrupting rating of 200,000 amperes r.m.s. symmetrical. The fuses shall be UL Class L. Fuses shall be "Low Peak Yellow". Caution labels to alert the end user of the engineered level of protection shall be field installed by the electrician. Labels shall be marked with the proper fuse rating.
 2. Circuits 0 to 600 ampere shall be protected by current limiting Bussmann Low-Peak Dual-Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts). all dual-element fuses shall have separate overload and short-circuit elements. Fuse shall incorporate a spring activated thermal overload element having a 284 degree F melting point alloy and shall be independent of the short-circuit clearing chamber. The fuse must hold 500% of rated current for a minimum of 10 seconds and be listed by Underwriters Laboratories, Inc., with an interrupting rating of 200,000 amperes r.m.s. symmetrical. The fuses shall be UL Class RK1. Caution labels shall be installed and marked with the proper rating on the equipment. Fuses using a Eutectic Alloy for overload protection will not be considered.
 3. Motor Circuits - All individual motor circuits rated 480 amperes or less shall be protected by Bussmann Low-Peak Dual-Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts). The fuses for 1.15 service factor motors shall be installed in ratings approximately 125% of motor full load current except where high ambient temperatures prevail, or where the motor drives a heavy revolving part which cannot be brought up to full speed quickly, such as large fans. Under such conditions the fuse should be 150% to 200% of the motor full load current. Larger HP motors shall be protected by Bussmann Type KRP-C Hi-Cap Time-Delay Fuses of the rating shown on the Drawings. 1.0 service factor motors shall be protected by Bussmann Low-Peak Dual-Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts) installed in ratings approximately 115% of the motor full load current except as noted above. The fuses shall be U.L. Class RK1 or L.
 4. When fused distribution switchgear is specified, circuit breaker panels shall be protected by Bussmann Low-Peak Dual-Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts) as shown on the Drawings. The fuses shall be U.L. Class RK1.
- E. Spares - Upon completion of the building, this Division shall provide the Owner with spare fuses as listed below.

1. 10% (minimum of 3) of each type and rating of installed fuses shall be supplied as spares.
2. Provide spare fuse cabinet, catalog number SFC, at locations shown on the drawings.

END OF SECTION 262813

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes individually mounted enclosed switches and circuit breakers used for the following:
 - 1. Service disconnecting means
 - 2. Feeder and branch circuit protection
 - 3. Motor and equipment disconnecting means

1.3 DEFINITIONS

- A. GFCI: Ground-fault circuit interruptor
- B. RMS: Root mean square
- C. SPDT: Single pole, double throw

1.4 SUBMITTALS

- A. Product Data: For each type of switch, circuit breaker, accessory, and component indicated. Include dimensions and manufacturers' data on features, performance, electrical characteristics, ratings and finishes.
- B. Shop Drawings: For each switch and circuit breaker.
 - 1. Dimensioned plans, elevations, sections and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features and ratings. Include the following:
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Current and voltage ratings.
 - c. Short-circuit current rating
 - d. Features, characteristics, ratings and factory settings of individual overcurrent protective devices and auxiliary components.
 - 2. Wiring Diagrams: Power, signal and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
- C. Manufacturer Seismic Qualification Certification: Submit certification that enclosed

switches and circuit breakers, accessories, and components will withstand seismic forces defined in Division 260505. Include the following:

1. Basis of Certification: Indicate whether withstand certification is based on actual tests of assembled components or on calculation.
 - a. The term “withstand” means “the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be operational after the seismic event.”
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in “Quality Assurance” article.
- E. Manufacturers Field Service Report.
- F. Maintenance Data: For enclosed switches and circuit breakers and for components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 section “Closeout Procedures,” include the following:
1. Routine maintenance requirements for components.
 2. Manufacturer’s written instructions for testing and adjusting switches and circuit breakers.
 3. Time-current curves, including selectable ranges for each type of circuit breaker.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NEMA AB 1 and NEMA KS 1.
- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment and adjacent surfaces. Maintain required work-space clearances and required clearances for equipment access doors and panels

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Fusible Switches:
 - a. Eaton Corp.; Cutler-Hammer Products
 - b. General Electric Co.; Electrical Distribution and Control Division
 - c. Siemens Energy & Automation, Inc.
 - d. Square D Co.
 2. Molded-Case Circuit Breakers
 - a. Eaton Corp.; Cutler-Hammer Products
 - b. General Electric Co.; Electrical Distribution and Control Division
 - c. Siemens Energy & Automation, Inc.
 - d. Square D Co.

2.2 ENCLOSED SWITCHES

- A. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle.
- B. Enclosed, Fusible Switch, 800 amps and smaller: NEMA KS 1, Type HD, with clips to accommodate specified fuses, lockable handle with two padlocks, and interlocked with cover in closed position.

2.3 ENCLOSED CIRCUIT BREAKERS

- A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low level over-loads, and instantaneous magnetic trip element for short circuits.. Adjustable magnetic trip setting for circuit-breaker frame sizes of 250 amps and larger.
 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front mounted, field-adjustable trip setting.
 3. Electronic Trip Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
 - a. Instantaneous trip
 - b. Long- and short-time pickup levels
 - c. Long- and short-time, time adjustments
 - d. Ground-fault pickup level with time delay

- B. Molded-Case Circuit Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
 - 1. Lugs: Mechanical style suitable for number, size, trip ratings, and material of conductors.
 - 2. Application Listing: Appropriate for application; type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
 - 3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - 4. Shunt Trip: 120 volt trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
 - 5. Under-Voltage Trip: Set to operate at 35 to 75 percent of rated voltage with field adjustable 0.1 to 0.6 second time delay.

2.4 ENCLOSURES

- A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.
 - 1. Outdoor Locations: NEMA 250, Type 3R
 - 2. Kitchen Areas: NEMA 250, Type 4X, stainless steel
 - 3. Wet or Damp Indoor Locations: NEMA 250, Type 4

2.5 FACTORY FINISHES

- A. Manufacturer's standard prime-coat finish ready for field painting.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with mounting and anchoring requirements specified in division 260505.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Install switches and circuit breakers according to manufacturer's written instructions.
- D. Provide circuit breaker type switches for all equipment for proper means of disconnect per

the NEC.

- E. Install switches and circuit breakers level, and plumb, within sight of and no more than 20 feet from equipment being served.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 260505.
- B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.4 CONNECTIONS

- A. Install equipment grounding connections for switches and circuit breakers with ground continuity to main electrical ground bus.
- B. Install wiring between switches and circuit breakers, and control and indication devices.
- C. 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.

3.5 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.
 - 2. Test continuity of each line- and load-side circuit.
- B. Testing: After installing enclosed switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- C. Infrared Scanning: After substantial completion, but not more than 60 days after final acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Open or remove doors or panels so connections are accessible to portable scanner.
 - 1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 2. Record of Infrared Scanning: Prepare a certified report that identifies switches and circuit breakers checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial

action.

3.6 ADJUSTING

- A. Set field-adjusted switches and circuit-breaker trip ranges.

3.7 CLEANING

- A. On completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 262816

SECTION 262950 - MECHANICAL EQUIPMENT 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 WORK INCLUDED

- A. Miscellaneous mechanical equipment and controls.
- B. 120 volt control power to each Automatic Control System Control Panel furnished under Section 15952.

1.3 RELATED WORK

- A. Section 260500 - General Provisions - Electrical
- B. Other Sections of Division 26.
- C. Applicable Sections of Division 23.

1.4 REFERENCES

- A. NFPA 70, 2014 - National Electrical Code.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Refer to applicable sections of Division 26.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Cooperate with Mechanical Contractor in connection of control circuits into Control Terminal Cabinet.
- B. Provide remote control connection to remote devices. (Except Automatic Control System devices)

- C. Provide power wiring to all motors, motor controls, and mechanical components as indicated on drawings or per Div. 23 requirements. Where not indicated on drawings coordinate all requirements with Div 23.

END OF SECTION 262950

SECTION 265100 - LIGHTING

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 SCOPE OF WORK

- A. Furnish and install lighting fixtures, lighting equipment and lamps and/or tubes for all lighting outlets as shown on the plans and listed on the fixture schedule.
- B. Furnish and install all mounting accessories, brackets, stems, etc., required for the complete installation of the lighting fixtures.
- C. Suitable factory cuts, drawings, or photographs (and such samples as may be required) with full description data on all fixtures shall be submitted for approval, copy of fixtures will not be acceptable.

1.3 REFERENCES

- A. NFPA 70 - 2014 - National Electrical Code.
- B. NFPA 170 - 1996 - Standard Fire Safety Symbols.

PART 2 - PRODUCTS

- 2.1 Fixture wire shall be in strict compliance with the latest National Electrical Code-2011. No fixture wiring shall be smaller than #12 AWG. Wiring shall be protected with tape or tubing at all points where abrasion is liable to occur. All wiring shall be concealed within fixture construction.

2.2 LAMPS

Fluorescent Color Temperature and Minimum Color-Rendering Index: 3500 K and 85 CRI, unless otherwise indicated.

Metal-Halide Color Temperature and Minimum Color-Rendering Index: For above 150 watt pulse start 3600 K and 70 CRI and for 150 watt and below 3200 K and 80 CRI, unless otherwise indicated.

Incandescent Lamps: Unless indicated otherwise, all lamps and extended service type lamps for operation at 120V.

2.3 FLUORESCENT LAMP BALLASTS

- A. General Requirements: Unless otherwise indicated, features include the following:
1. Designed for type and quantity of lamps.
 2. Total Harmonic Distortion Rating: Less than 20 percent.
 3. Sound Rating: A.
 4. Rebate Program Compliance: All electronic ballasts will be on the local utilities list of approved ballasts.
 5. Voltage: Field verify all voltage requirements prior to releasing lighting package and provide ballasts.
- B. Electronic Ballasts for Linear Lamps: Unless otherwise indicated, features include the following, besides those in "General Requirements" Paragraph above:
1. Certified Ballasts Manufacturer Certification: Indicated by label.
 2. Encapsulation: Without voids in potting compound.
 3. Parallel Lamp Circuits: Multiple lamp ballasts connected to maintain full light output on surviving lamps if one or more lamps fail.
 4. Ballasts factor: 0.90.
- C. Ballasts for Compact Lamps: Unless otherwise indicated, additional features include the following:
1. Type: Electronic fully encapsulated in potting compound.
 2. Power Factor: 90 percent, minimum.
 3. Operating Frequency: 20 kHz or higher.
 4. Flicker: Less than 5 percent.
 5. Lamp Current Crest Factor: Less than 1.7.
 6. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.
 7. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
 8. End of Lamp Life Protection: Ballasts are designed with integral end of lamp life failure protection circuit to disconnect power to lamps at end of lamp life.
- D. Ballasts for Low-Temperature Environments: As follows.
1. Temperatures Minus 20 Deg F and Above: Electromagnetic type designed for use with high-output lamps. Coordinate lamping prior to releasing of fixture package and provide lamping as required to meet above spec.

2.4 HIGH-INTENSITY-DISCHARGE LAMP BALLASTS

- A. General: Comply with ANSI C82.4. Unless otherwise indicated, features include the following:
1. Type: Constant wattage autotransformer or regulating high-power-factor type, unless otherwise indicated.

2. Operating Voltage: Match system voltage.
 3. Minimum Starting Temperature: Minus 22 deg F for single lamp ballasts.
 4. Normal Ambient Operating Temperature: 104 deg. F.
 5. Open-circuit operation that will not reduce average life.
 6. Auxiliary, Instant-on, Quartz System: Automatically switches quartz lamp on when fixture is initially energized and when momentary power outages occur. Automatically turns quartz lamp off when high-intensity-discharge lamp reaches approximately 60 percent light output.
- B. Encapsulation: Manufacturer's standard epoxy-encapsulated model designed to minimize audible fixture noise.

PART 3 -EXECUTION

- 3.1 Verify all ceiling types and construction before ordering lighting fixtures to confirm that final ceilings approved for installation and the lighting fixtures are compatible to each other in all respects.
- 3.2 Lighting fixtures shall not be installed until finished coat of paint has been applied to ceilings and walls and allowed to dry thoroughly.
- 3.3 Furnish, install and wire a light fixture at every outlet as indicated on the plans. In the event a fixture type designation is omitted from the drawing, furnish and install the type as designated by the Architect or Engineer.
- 3.4 All fixture units, when installed, shall be free from warps, dents, etc. They shall be clean of dirt, smudges and all foreign matter, and shall be left highly polished.
- 3.5 All lighting fixtures shall be independently supported apart from general ceiling construction.
- 3.6 Upon completion of the installation of the lighting fixtures and lighting equipment, they must be in first-class operating condition and in perfect condition as to finish, etc. At time of final inspection, all fixtures and equipment must be complete with lamps, starters, and required glassware or reflectors, which must be clean and free from defects. Any fixtures, reflectors, or glassware broken prior to the time of final inspection must be restored without cost to the Owner. Just prior to occupancy, all fixtures shall be relamped with new lamps, if needed.
- 3.7 Adjustable lighting fixtures shall be focused and adjusted as directed by the Owner or Engineer.
- 3.8 Exits shall have chevron directional, be visible from all directions, and shall have minimum 6" high and 2" wide letters (letter "I" shall be 3/4" wide), 3/8" spacing between letters. Illuminance shall be 0.06 foot-lamberts minimum. Exit signs shall have battery back-up power, exits shall be visible from 40' in any direction.

END OF SECTION 265100

SECTION 266100 - COMMISSIONING

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 SCOPE OF WORK

- A. Testing and Adjusting of electrical systems.
- B. Certification and Demonstration of system operations and performance.
- C. Owner Instruction.
- D. Operations and Maintenance Manuals.
- E. "As-Built" Drawings.

1.3 RELATED DOCUMENTS

- A. Section 260500 - General Provisions Electrical.
- B. Section 260505 - Basic Materials and Methods.

1.4 QUALITY ASSURANCE

- A. Perform all testing , demonstration, etc of Fire Alarm, Call-For-Aid and similar systems as required for the satisfaction of local officials.
- B. Perform all testing as required by the equipment manufacturers for acceptance and guarantee of equipment.

PART 2 - PRODUCTS

- 2.1 None Required.

PART 3 - EXECUTION

3.1 TESTING

- A. Refer to specific Section of the Specification governing specific equipment testing.
- B. Coordinate all testing operations with Owner and Architect. Provide sufficient notice to all affected parties and review agencies.
- C. Provide written documentation of results from all tests performed, including appropriate acceptance by equipment/system manufacturer and local building and/or fire officials.

3.2 SCHEDULE AND SEQUENCE OF WORK

- A. Upon the completion of each segment or phase of work that is turned over to the Owner for full or partial occupancy, fully test and certify each system as operational and meeting project performance requirements.
- B. Obtain sign-off from Officials Having Jurisdiction for each system, sub-system, or portion of work as required for Owner's use and occupation of areas of completed work.
- C. Coordinate sequence and schedule of work with the General Contractor and Owner's use of the building.

3.3 DOCUMENTATION

- A. Document all revisions, changes due to field conditions, etc. on a clean set of Drawings during the construction process. Transfer this information onto the final "as-built" documents. Refer to Section 260500 for additional requirements.
- B. Refer to Section 260500 for O & M manual and Owner instruction requirements.
- C. All documentation relating to system testing, sign-off, start-up and commissioning exercises shall be submitted for record to the Owner and Architect. Copies of all such documentation shall be incorporated into the project Operation and Maintenance Manual.

END OF SECTION 266100

SECTION 323120 - DECORATIVE VINYL FENCES AND GATES

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. Decorative vinyl fences.
 - 2. Swing gates.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for concrete.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For gates. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each fence material and for each color specified.
 - 1. Provide Samples 12 inches in length for linear materials.
 - 2. Provide Samples 12 inch by 12 inch square for sheet materials.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, sections, attachment details and other details as necessary.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For information to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver panels, 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. Store fence panels on edge upright. Never store fence panels flat.
- C. Handle panels and components carefully to avoid chipping edges or damaging components in any way.

PART 2 - PRODUCTS

2.1 DECORATIVE VINYL FENCES

- A. Decorative Vinyl Fences: Fences made from vinyl shapes.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide products by the following:
 - a. Alpa Outdoor Products, 101 Glidden Road, Brampton, Ontario, L6T 3W6, Canada.
 - 1) Model "Cape Cod," with gates.
 - 2) Fence Style: Full privacy 6' h.
- B. Substitutions: Requests for substitutions will be considered in accordance with provisions of Section 012500 "Substitution Procedures."
- C. Posts: Square vinyl tubing.
 - 1. Line Posts: 4 by 4 inches with Manufacturer's standard wall thickness.
 - 2. End and Corner Posts: 4 by 4 inches with Manufacturer's standard wall thickness.
 - 3. Swing Gate Posts: 4 by 4 inches with Manufacturer's standard wall thickness.
- D. Steel Post Inserts and Base Plates: Manufacturer's steel posts and base plates for concrete.

- E. Stiffeners: Provide Manufacturer's metal U-Fence stiffeners at all four sides of gates and at fences.
- F. Post Caps: Manufacturer's standard vinyl caps.
- G. Infill: Vinyl panel.
- H. Mounting Brackets: Manufacturer's standard vinyl U-mount brackets.
- I. Fence Fasteners: Manufacturer's standard screws finished to match finish of fencing.

2.2 SWING GATES

- A. Gate Configuration: As indicated.
- B. Gate Frame Height: 72 inches.
- C. Gate Opening Width: 39 inches, unless otherwise indicated.
- D. Additional Rails: Provide as indicated, complying with requirements for fence rails.
- E. Infill: Comply with requirements for adjacent fence.
- F. Hardware: Manufacturer's standard latches and hinges. Fabricate latches with integral eye openings for padlocking.

2.3 MISCELLANEOUS MATERIALS

- A. Concrete: Normal-weight, air-entrained, ready-mix concrete complying with requirements in Section 033000 "Cast-in-Place Concrete" with a minimum 28-day compressive strength of 3000 psi, 3-inch slump, and 1-inch maximum aggregate size.
- B. Fasteners for Posts to Concrete: Four wedge-all anchors for each post according to fence manufacturer's written recommendations.
- C. Silicone, Nonstaining, S, NS, 100/50, T, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.
 - 1. Products: Subject to compliance with requirements, provide products from the following:
 - a. Dow Corning Corporation.
 - 2. Substitutions: Requests for substitutions will be considered in accordance with provisions of Section 012500 "Substitution Procedures."

2.4 VINYL FINISHES

- A. Finishes: Manufacturer's standard finishes.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.
- B. Do not begin installation before final grading is completed unless otherwise permitted by Architect.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 DECORATIVE FENCE INSTALLATION

- A. Install fences according to manufacturer's written instructions.
- B. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil. Provide Manufacturer's steel posts and base plate.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing.
 - 2. Exposed Concrete: Extend 2 inches above grade. Finish and slope top surface to drain water away from post.
 - 3. Space posts uniformly according to Manufacturer's written recommendations.
 - 4. Post Cap Installation: Install post caps with a bead of sealant in the inside under caps and push cap down over posts.

3.4 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.5 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.

END OF SECTION 323119

Exhibit A
Contractors Insurance Requirements

All Contractors are required to provide proof of the required insurance coverage before entering the premises or commencing any work at any ACES facility. Contractors must obtain, at their own expense, all the insurance required here from an insurance company A.M. Best rated as "A-VII" or better, and acceptable evidence of such insurance must be properly furnished to, and approved by, ACES.

All Contractors are subject to the same requirements. It is the responsibility of the primary contractor to obtain acceptable evidence of insurance from subcontractors.

ACES also requires that they be named as an additional insured on the commercial general liability policy(ies). The commercial general liability policy must be specifically endorsed with ISO Endorsement CG 20 10 (or equivalent) *or* ISO Endorsement CG 20 26 (or equivalent), *and* ISO Endorsement CG 20 37 (or equivalent)." These form numbers must be specifically referenced on the certificate of insurance, and copies of these endorsements naming ACES as additional insured must be furnished with the required certificate of insurance. If the insurance company uses a different form to provide ACES with an additional insured status on your policies, copies must be provided in advance with the insurance certificate for review and approval by ACES.

The amounts of insurance available to ACES as additional insured must be equal to the full policy limits carried by the Contractor, including primary and excess (umbrella) liability policies or the amounts specified below, whichever is greater. Coverage provided under excess or umbrella policies must be at least as broad as that found in required underlying policies. All coverage must be primary and noncontributory as to ACES.

The proper name for the entity to be named as additional insured is: **"Area Cooperative Educational Services, and/or related or affiliated entities."**

Evidence of compliance with these requirements is with the ACCORD form 25, "Certificate of Liability Insurance", plus copies of any required additional insured endorsements. Certificates should be sent to:

Tim Gunn, Director of Facilities,
Area Cooperative Educational Services,
350 State Street,
North Haven, CT 06473-3108

Current insurance certificates must be furnished to ACES at all times. Replacement certificates must be furnished ten (10) days *prior to the expiration or replacement* of referenced policies.

ACES reserves the right to make commercially reasonable changes in these requirements during the term of any work or project.

Types and Minimum Coverage Amounts	
Commercial General Liability (“CGL”)	<p>\$1,000,000 per occurrence/ \$2,000,000 aggregate bodily injury/property damage \$1,000,000 Personal and Advertising Injury \$2,000,000 Products-Completed operations aggregate</p> <p>The CGL policy must include coverage for:</p> <ul style="list-style-type: none"> • liability from premises and operations. • liability from products or completed operations. • liability from actions of independent contractors. • liability assumed by contract.
Conditions	<p>All coverage provided to ACES under this section must be primary and non-contributory with any other insurance available to ACES. ACES must be specifically named as “additional insured” on the CGL policy with ISO form CG 20 10 or CG 20 26 or equivalent acceptable to ACES. ACES must <i>also</i> be named as “additional insured” for Products/Completed Operations on the CGL policy with form CG 20 37 or equivalent acceptable to ACES.</p> <p>Any Aggregate limit must apply per job/project.</p> <p>Products/completed operations must be carried for 2 years after completion of job/acceptance by ACES.</p>
Automobile Liability	<p>\$1,000,000 each accident \$2,000,000 aggregate for bodily injury/property damage, including hired owned & non-owned vehicles.</p>
Umbrella Liability	<p>\$3,000,000</p> <p>Limits must be excess over underlying limits described above. All coverage provided to ACES under this section must be at least as broad as that found in the underlying policies, and must be primary and non-contributory with any other insurance available to ACES.</p>
Workers' Compensation	<p>Liability meeting statutory limits mandated by the state and Federal laws with minimum limits of:</p> <p>\$1,000,000 each accident for bodily injury by accident \$1,000,000 each employee for bodily injury by disease \$1,000,000 policy limit for bodily injury by disease</p>
Employers Liability	<p>\$1,000,000 each accident</p>
Professional Liability	<p>\$1,000,000</p>
Contractor's Pollution Liability	<p>\$1,000,000 per occurrence / \$1,000,000 aggregate</p>

Exhibit B Scope of Work

PROJECT NAME: ACES INTERIOR RENOVATIONS & IMPROVEMENTS TO
300 WASHINGTON ST.
LOCATION: 300 Washington St. Middletown CT.
OWNER: ACES
ARCHITECT PATRIQUIN ARCHITECTS, PC.
ENVIROMENTAL FUSS & O'NEILL
DATE: July 28, 2017

DESCRIPTION OF WORK TO BE PERFORMED:

This Contractor shall provide for the furnishing and installation of all **ACES INTERIOR RENOVATIONS & IMPROVEMENTS TO 300 WASHINGTON STREET** and related work necessary to achieve a complete and functional installation that reasonably meets the intent and requirements of the contract documents and is acceptable to the Owner. It is further understood that the project drawings and specifications provided may not be fully detailed but such information can be reasonably inferred by similar details or requirements indicated elsewhere in the contract documents and that such cost is included in Contract/Bid Submission price.

SPECIFICATIONS:

In general, this Contractor shall include and provide all material, equipment and all things necessary to perform **ACES INTERIOR RENOVATIONS & IMPROVEMENTS TO 300 WASHINGTON STREET** and related Work per or reasonably implied by the Contract Documents including but not limited to all work in Specification sections:

All as listed in the “ACES INTERIOR RENOVATIONS & IMPROVEMENTS TO 300 WASHINGTON STREET” Project Manual dated July 28, 2017 Table of Contents

MISCELLANEOUS SCOPE OF WORK TO BE INCLUDED:

Without the intent of limiting the scope of work, this section contains additional scope clarifications that compliment the Contract Documents. The items listed herein are not intended to be a complete list of work items to be performed under this Subcontractors scope of work. Furthermore, details referenced are included for convenience but are not intended to identify all applicable details.

1. Contractor has included any and all cost necessary to meet the Project Schedule dates and allow enough time for follow up work by others to be completed within the schedule dates. **The Financial Grant for this Project has an expiration date. Therefore Time is of the essence, Contractor shall perform its Work to make the following required milestones:**
 - a) **Substantial Completion October 27, 2017**
 - b) **Final Acceptance November 7, 2017. Includes all close out and final requisition.**
2. Contractor has included the required manpower, labor, cost for overtime, shift work and/or premium time to perform utility tie-ins, phasing relating work and any work not allowed by the Owner during normal working hours. Contractor shall submit a detailed Construction Schedule to the Architect and Owner within 10 days of Award and in a format acceptable to the Architect and Owner. Contractor shall update its schedule weekly and forward to the Architect and Owner by the following Monday before noon.
3. This Project is a **Prevailing Wage Project**. General Contractor shall submit it and all its subcontractors certified payroll with it monthly application for payment. Please refer to Exhibit D for current prevailing wage rates from the Connecticut Department of Labor.

4. Contractor shall reference the current State of Connecticut Change order Manual procedures when submitting change orders. The allowable Contractor's combined overhead and profit on change orders for this project shall not exceed fifteen (15%) percent.
5. Contractor shall keep its work area broom clean, install dust protection, must not store any materials or tools in hallways that restrict access to the exits by any building occupants.
6. Contractor to refer to all Division 1 specifications for additional requirements. Note Summary of Work section in particular for additional Scope items.
7. Contractor is required to perform all Demolition and Hazardous Abatement. Contractor must refer to Fuss & O'Neill Limited Hazardous Building Material Inspection report dated October 14, 2016, attached as an exhibit to the Project Manual, as well as Division 02 specifications for removal of asbestos containing materials and for removal of ballasts and lamps containing PCBs or mercury.
8. Contractor shall provide all excavation, concrete demolition, connections, back flow prevention and meter for a complete installation of the fire main service from the street connection to the new fire sprinkler room indicated on the drawings.
9. Contractor shall schedule an on-site coordination meeting with its Subcontractors, the Architect and Owner before proceeding with any MEP and Sprinkler Work.
10. Contractor shall provide a complete Fire Sprinkler system. The contractor is responsible for providing shop drawings and hydraulic calculations signed and stamped by a licensed PE in the State of Connecticut, as well as all permits, local approval, inspections and fees. The sprinkler piping shall be installed above the ceiling on the first floor. On the second floor, the sprinkler pipe is below the ceiling due to low temperature concerns above the ceiling. Contractor shall coordinate with all other Trades, the installation of its Work. All Work to be installed to look as pleasing as possible.
11. Contractor shall install new heating and cooling system as shown on the contract documents. An **ADD Alternate** shall be included in the Bid for a BMS system as shown on the contract documents.
12. All new exterior wall penetrations for sprinklers, fire department connections, and HVAC shall be assumed to contain hazardous materials and must be treated accordingly. See additional notes on contract documents.
13. Contractor shall provide all new walls where indicated on the contract documents, perform all patching for HVAC installation, including the exterior of the building.
14. Contractor is responsible for installing all Fire Sealant as required by code.
15. Contractor is responsible for all required access doors whether shown on the contract documents or not.
16. Contractor to install new casework in the classrooms as shown on the contract documents.
17. Contractor to install new kitchenette. Contractor to relocate existing appliances and utilities.

18. Contractor to install new guardrail and millwork in sunken area on first floor.
19. Contractor to replace egress doors and hardware as indicated on the contract documents.
20. Contractor to provide all Electrical Work as shown on the contract documents
21. Contractor to install all power, IT and Telecommunication cable and outlets on the first floor as part of the base bid.
22. Contractor to upgrade guardrails at existing second floor stair landings per the contract documents.
23. Contractor is responsible for all touch up painting and areas effected by construction. For example the installation of doors, new walls, behind electric base heaters and thermostats. Paint to match existing color: Benjamin Moore Super Spec Semi-Gloss Decorator White.
24. Furnish and Install all reference hardware as shown on the contract documents. The base bid includes new hardware and doors at the fire stairs. General Contractor to include as an **add alternate** on the bid form the cost for the following:
 - a. Replace the existing classroom, office, and storage room hardware with new lever door hardware equal to commercial grade Harney Vigilant classroom #86504 in satin chrome finish.
 - b. Replace existing first floor in-classroom bathroom door hardware with new lever door hardware equal to commercial grade Harney Vigilant Passage #86502 in satin chrome finish.
25. The second floor additional electrical outlets, IT and telecoms boxes shall be included as an **add alternate** on the Bid Form.
26. General Contractor is responsible for all exterior penetrations. It is possible that material concealed within the interior cavity of the building's exterior wall may contain *asbestos containing material* (ACM). All exterior penetration locations shall be considered to contain ACM within the wall cavity and any penetrations made should be conducted by properly licensed and trained personnel working for a Connecticut licensed abatement contractor, in accordance with the project abatement specifications. The owner would like any suspect ACM related to the wall penetrations to be tested for asbestos content. Therefore, the General Contractor shall coordinate the Owner's Environmental Company to be present during the first penetration drilled and sample any suspect ACM for asbestos content.
27. The LED lighting upgrade is not included in this scope of work. The LED lighting will be performed by the Owner's Contractor ("LED contractor"). The LED contractor shall be responsible for the removal of the existing lights and installation of the new LED fixtures. The existing fluorescent bulbs and tubes are to be removed and disposed of by the LED Contractor. The existing ballasts shall be removed and placed in a container provided by the General Contractor. It is the General Contractors scope to properly dispose of this material. The General Contractor shall schedule and coordinate the work being performed by the LED Contractor with its Schedule of Work. The General Contractor is responsible for the installation of the ceiling and the coordination of this Work with LED Contractor. All finished ceiling and lighting work shall be complete by Substantial Completion.

28. The building will be partially occupied during construction, and ACES staff must have access to their offices on the second floor during construction. The General Contractor shall inform ACES of Work activities that will affect ACES access to their offices. These Work activities include but are not limited to: Hazardous Abatements work, demolition of the first floor concrete slab, selective demolition of existing base board radiators and thermostats, coring of the second floor deck for new fire sprinkler and HVAC penetrations, and second floor sprinkler pipe and HVAC installation and testing. The General Contractor agrees to give ACES a minimum of five (5) days' notice before the start of any Work activity that may impact ACES staff.
29. The General Contractor is to supply the specified heat pump with the necessary controls to add a fully integrated BMS in the future. As an **add bid alternative** option the General Contractor is to include on the bid form the price to add a fully integrated Niagara BMS.
30. The Owner will be hiring the Security contractor directly. The General Contractor shall communicate and coordinate directly with the Security Contractor to ensure that this work is property scheduled, installed and operational by the Substantial Completion date.

INCLUSIONS:

EXCLUSIONS:

1. Security System by Owner, General Contractor to coordinate work.
2. LED Lighting by Owner, General Contractor to coordinate work.

CLAIRIFICATIONS:

I have reviewed the above Exhibit B and I am in agreement with all items and have included provisions in Bid Submission/Contract Price.

CONTRACTOR: _____
NAME

BY: _____
SIGNATURE

NAME: _____
PRINT

TITLE: _____

DATE: _____

Exhibit C

**LIMITED HAZARDOUS BUILDING MATERIALS INSPECTION REPORT DATED
NOVEMBER 2, 2016**

**Limited Hazardous Building Materials
Inspection**

**October 14, 2016
300 Washington Street
Middletown, Connecticut**

**ACES
New Haven, Connecticut**

November 2, 2016



FUSS & O'NEILL
EnviroScience, LLC

Fuss & O'Neill EnviroScience, LLC
146 Hartford Road
Manchester, CT 06040



FUSS & O'NEILL
EnviroScience, LLC

November 2, 2016

Mr. Tim Gunn
Director of Facilities
ACES
350 State Street
New Haven, CT 06473

**Re: Limited Hazardous Building Materials Inspection
Two Story Addition and Connection Hallway
300 Washington Street, Middletown, CT**
Fuss & O'Neill EnviroScience Project No. 20160749.A1E

Dear Mr. Gunn:

Enclosed is the report for the limited hazardous building materials inspection conducted in response to potential renovations for the two story addition and connection hallway (potential lease area) of the building located at 300 Washington Street in Middletown, Connecticut (the "Site"). The work was conducted for ACES (the "Client").

The services were performed on October 14, 2016, by Fuss & O'Neill EnviroScience, LLC licensed inspectors and included a limited asbestos inspection, a lead-based paint determination, an inventory of suspect PCB-containing source building materials, and an inventory of PCB-containing ballasts and mercury-containing devices. The information summarized in this report is for the above-mentioned materials only. The work was performed in accordance with our written proposal dated August 30, 2016, and revised September 1, 2016.

If you should have any questions regarding the contents of this report, please do not hesitate to contact me at (860) 646-2469, extension 5333. Thank you for this opportunity to have served your environmental needs.

Sincerely,



Jared D. Smith, CSP
Project Manager

JDS/kr

Enclosure

146 Hartford Road
Manchester, CT
06040
t 860.646.2469
800.286.2469
f 860.533.5143

www.fando.com

Connecticut
Massachusetts
Rhode Island

Table of Contents

Limited Hazardous Building Materials Inspection Report 300 Washington Street, Middletown, CT ACES

1	Introduction	1
2	Asbestos Inspection.....	2
2.1	Methodology	2
2.2	Building and Mechanical System Description.....	4
2.3	Results	4
2.4	Discussion	4
2.5	Conclusions and Recommendations.....	4
3	Lead-Based Paint Determination	5
3.1	Methodology	5
3.2	XRF Determination Results.....	6
3.3	Discussion	6
3.4	Conclusion and Recommendations	7
4	Inventory of Suspect Polychlorinated Biphenyls (PCBs)-Containing Building Materials	7
4.1	Background	7
4.2	Discussion	8
4.3	Conclusions	8
5	PCB-Containing Fluorescent Light Ballasts and Mercury-Containing Lamps....	9
5.1	PCB-Containing Fluorescent Ballasts.....	9
5.2	Mercury-Containing Devices	9

Tables

End of Report

1. Summary of Suspect Asbestos-Containing Materials
2. Summary of Asbestos-Containing Materials Inventory
3. Suspect PCB-containing Source Building Materials Inventory
4. PCB/DEHP-Containing Light Ballasts Inventory
5. Mercury-Containing Equipment Inventory

Appendices

End of Report

APPENDIX A	LIMITATIONS
APPENDIX B	INSPECTOR LICENSES AND ACCREDITATIONS
APPENDIX C	ASBESTOS LABORATORY REPORT AND CHAIN OF CUSTODY FORMS
APPENDIX D	SITE PHOTOGRAPHS

APPENDIX E	LEAD PAINT DETERMINATION FIELD DATA SHEETS
APPENDIX F	SITE FLOOR PLANS

1 Introduction

On October 14, 2016, Fuss & O'Neill EnviroScience, LLC (EnviroScience) representatives Mr. Scott Mossey and Ms. Stacy Vanderveer performed a limited hazardous building materials inspection for potential renovations at the two story addition and connection hallway (potential lease area) of the building located at 300 Washington Street in Middletown, Connecticut (the "Site"). The work was conducted for ACES (the "Client") in accordance with our written scope of services dated August 30, 2016, revised September 1, 2016, and is subject to the limitations included in *Appendix A*.

The limited inspection included the following:

- asbestos containing materials (ACM) inspection;
- lead-based paint (LBP) determination;
- suspect polychlorinated biphenyls (PCB) building materials inventory; and
- PCB-containing light ballasts and mercury-containing device inventory.

This limited hazardous building materials inspection was performed in response to potential renovation activities and included the two-story addition and connection hallway of the building and associated exterior and roof.

This inspection was limited to non-invasive and discrete sampling techniques. Intrusive or destructive investigative techniques were not performed at the Site to access and observe concealed areas that may have had suspect ACMs that were hidden or obstructed from normal view. Specific areas that were not inspected include the following:

- Beneath window and door frames;
- wall cavities;
- pipe chases;
- spaces above fixed ceilings;
- foundation walls;
- spaces behind the brick façade;
- areas within or behind mechanical equipment (including freezers and refrigeration units);
- behind mirrors, blackboards and signage; and
- vapor/moisture barrier under floors or on concrete foundations.

We have excluded collection and analysis of building materials for PCBs. Sampling for PCBs is presently not mandated by the Environmental Protection Agency (EPA); however, significant liability risk for disposing of PCB-containing wastes exists. Recent knowledge of PCBs within these matrices has become more prevalent, especially with remediation contractors, waste haulers, and disposal facilities. Many property Owners have become subject to large changes in schedule, scope, and costs as a result of failure to identify this possible contaminant prior to renovation or demolition.

2 Asbestos Inspection

A property Owner must ensure that a thorough ACM inspection is performed prior to possible disturbance of suspect ACM during renovation or demolition activities. This is a requirement of the EPA National Emission Standards for Hazardous Air Pollutants (NESHAP) regulation located at Title 40 CFR, Part 61, Subpart M.

On October 14, 2016, Mr. Scott Mossey and Ms. Stacy Vanderveer of EnviroScience conducted the limited inspection. Mr. Mossey and Ms. Vanderveer are both State of Connecticut Department of Public Health (CTDPH)-licensed Asbestos Inspectors. Refer to *Appendix B* for the Asbestos Inspector licenses and accreditations.

2.1 Methodology

The limited inspection was conducted by visually inspecting for suspect ACM and touching each of the suspect materials. The suspect materials were categorized into three EPA NESHAP groups: friable and non-friable Category I and Category II type ACM.

- A Friable Material is defined as material that contains greater than 1 percent ($> 1\%$) asbestos that when dry **can** be crumbled, pulverized, or reduced to powder by hand pressure.
- A Category I Non-Friable Material refers to material that contains $> 1\%$ asbestos (i.e., packings, gaskets, resilient floor coverings, and asphalt roofing products) that when dry **cannot** be crumbled, pulverized, or reduced to powder by hand pressure.
- A Category II Non-Friable Material refers to any non-friable material excluding Category I materials that contain $> 1\%$ asbestos that when dry **cannot** be crumbled, pulverized, or reduced to powder by hand pressure.

The suspect ACM were also categorized into their applications including Thermal System Insulation (TSI), Surfacing ACM (S), and Miscellaneous ACM (M). TSI includes those materials used to prevent heat loss/gain or water condensation on mechanical systems. Examples of TSI are pipe insulation, boiler insulation, duct insulation, and mudded pipe fitting insulations. Surfacing ACM includes those ACM that are applied by spray, trowel, or otherwise applied to an existing surface. Surfacing ACM is commonly used for fireproofing, decorative, and acoustical applications. Miscellaneous materials include those ACM not listed as thermal or surfacing, such as linoleum, vinyl asbestos flooring, ceiling tiles, caulking, glues, construction adhesives, etc.

The EPA recommends collecting suspect ACM samples in a manner sufficient to determine asbestos content and to segregate each suspect type of homogenous (similar in color, texture, and date of application) materials. The EPA NESHAP regulation does not specifically identify a minimum number of samples to be collected for each homogeneous material, but the NESHAP regulation does recommend the use of sampling protocols included in Title 40 CFR, Part 763, Subpart E: Asbestos Hazard Emergency Response Act (AHERA).

The EPA AHERA regulation requires a specific number of samples be collected based on the type of material and quantity present. This regulation includes the following protocol:

1. Surfacing Materials (S) (i.e., plasters, spray-applied fireproofings, etc.) must be collected in a randomly distributed manner representing each homogenous area based on the overall quantity represented by the sampling as follows:
 - a. Three (3) samples collected from each homogenous area that is less than or equal to 1,000 square feet.
 - b. Five (5) samples collected from each homogenous area that is greater than 1,000 square feet but less than or equal to 5,000 square feet.
 - c. Seven (7) samples collected from each homogenous area that is greater than 5,000 square feet.
2. Thermal System Insulation (TSI) (i.e., pipe insulations, tank insulations, etc.) must be collected in a randomly distributed manner representing each homogenous area. Three (3) samples must be collected from each material. Also, a minimum of one (1) sample of any patching materials applied to TSI presuming the patched area is less than 6 linear or square feet should be collected.
3. Miscellaneous materials (M) (i.e., floor tile, gaskets, construction mastics, etc.) should have a minimum of two (2) samples collected for each type of homogenous material. Sample collection was conducted in a manner sufficient to determine asbestos content of the homogenous material as determined by the inspector.

The inspectors collected samples of those suspect ACM anticipated to be disturbed by potential renovation activities, and prepared proper chain-of-custody forms for transmission of the samples to EMSL Analytical Inc. for analysis. EMSL is a State of Connecticut-licensed and American Industrial Hygiene Association (AIHA)-accredited asbestos laboratory. The sample locations, material type, sample identification, and asbestos content are identified by bulk sample analysis in Table 1 attached hereto. Suspect ACM not listed in Table 1 that may be identified at a later date at the Site, should be assumed to be ACM until sample collection and analysis indicate otherwise. Initial asbestos sample analysis was conducted using the EPA Interim Method for the Determination of Asbestos in Bulk Building Materials (EPA/600/R-93/116) via Polarized Light Microscopy with Dispersion Staining (PLM/DS).

Two interior locations located on the first floor of the building used by the Sunday School program were locked and unable to be accessed during this inspection. These areas will require a visual assessment and additional sampling may be necessary if non-homogenous materials are identified to be present.

The exterior and roof were included in the scope of work for this limited inspection. EnviroScience coordinated a sub-contractor, Silktown Roofing, to assist in obtaining and repairing roof sample locations.

Subsurface investigations including, but not limited to, concrete foundations were not performed. Also, EnviroScience did not conduct subsurface investigations to identify suspect cementitious pipe or other subgrade features at the Site.

2.2 Building and Mechanical System Description

The portion of the building to be potentially leased by ACES includes a two story addition with no basement, and a one-story glass connector, which were added at an unknown date to the adjacent original church building. The building contains approximately 9,000 square feet (SF) of total floor area. The building is primarily heated with electric baseboard heat.

2.3 Results

Utilizing the EPA protocol and criteria, the following materials were determined to be **ACM**:

- Interior door window glazing compound;
- Interior laminate backsplash adhesive;
- Interior expansion joint caulking compound;
- Exterior fascia board; and
- Exterior roof flashing materials.

Refer to **Table 1** for a complete list of ACM and non-ACM identified as part of this inspection. Refer to **Table 2** attached hereto for the ACM inventory. Refer to *Appendix C* for the asbestos laboratory reports and chain-of-custody forms. Refer to *Appendix D* for site photographs.

2.4 Discussion

The EPA, the Occupational Safety and Health Administration (OSHA), and the CTDPH, define a material that contains greater than one percent (> 1%) asbestos, utilizing PLM/DS, as being an ACM. Materials that are identified as "none detected" are specified as not containing asbestos.

Suspect ACM not identified during this inspection should be presumed to contain asbestos until sample collection and laboratory analysis indicate otherwise.

Additionally, the EPA has suggested that materials that are non-friable organically bound (NOB) materials (e.g., asphaltic-based materials, adhesives, etc.) are recommended for further confirmatory analysis utilizing Transmission Electron Microscopy (TEM). Twenty-eight of the collected samples were recommended to be analyzed by TEM. The results of TEM analysis are denoted in Table 1.

2.5 Conclusions and Recommendations

Based on visual observations, sample collection, and laboratory analysis, ACM are present at the Site.

Prior to disturbance, ACM that would likely be impacted by the proposed renovation activities must first be abated by a state-licensed Asbestos Abatement Contractor. This is a requirement of CTDPH, and EPA NESHAP regulations governing asbestos abatement.

Due to the inability to effectively separate some types of multi-layered ACMs (e.g., floor tile/mastic, gypsum board/joint compound, mastic/plywood, etc.) from non-ACM, these materials are considered asbestos-contaminated and must be managed as ACM for the purposes of removal and disposal.

EnviroScience recommends that a comprehensive scope of work and technical specification be developed as part of renovation plans for the Site. We have provided a cost to develop the specifications for inclusion in the overall renovation plans. We have also developed an opinion of cost for the complete removal of all identified asbestos under a separate cover. Note the total cost is inclusive of removing all asbestos, and a more limited scope can be tailored to any specific renovation work as necessary.

EnviroScience recommends that if any ACMs are to remain in the building following renovation activities, the ACM should be managed in-place under an Asbestos Management Plan in accordance with EPA Asbestos Hazard Emergency Response Act (AHERA) regulations.

EnviroScience understands ACES is in the process of preparing renovation plans for the Site; therefore, once the plans are finalized, EnviroScience recommends review of the plans and a supplemental inspection be performed to identify potentially concealed materials.

This report is not intended to be utilized as a bidding document or as a project specification document. The report is designed to aid the building owner, architect, construction manager, general contractors, and asbestos abatement contractors in locating identified ACM.

3 Lead-Based Paint Determination

On October 14, 2016, Mr. Mossey and Ms. Vanderveer of EnviroScience performed a lead-based paint (LBP) determination associated with coated building components at the Site that may be disturbed during renovation activities. An X-ray fluorescence (XRF) analyzer was used to perform the LBP determination. The determination was conducted in accordance with generally-accepted industry standards for non-residential (i.e., not child-occupied) buildings. EnviroScience understands the leased portion of the building is currently used for Sunday School activities; however, the LBP determination was not intended to be compliant with EPA and DPH regulations for childcare facilities.

3.1 Methodology

A Radiation Monitoring Device Model LPA-1, serial number 1138, was utilized for the LBP determination. The instrument was checked for proper calibration prior to use as detailed by the manufacturer and the Performance Characteristic Sheet (PCS) developed for the instruments.

For the purpose of this LBP determination, representative building components were tested as part of this limited inspection. Individual repainting efforts are not discoverable in such a limited program. LBP issues involving properties that are not residential are regulated to a limited degree for worker protection relating to paint-disturbing work activities and waste disposal.

Worker protection is regulated by OSHA regulations, as well as CTDPH regulations. These regulations involve air monitoring of workers to determine exposure levels when disturbing lead-containing paint. An LBP determination cannot determine a safe level of lead, but is intended to provide guidance for implementing industry standards for lead in paint at identified locations. Contractors may then better determine exposure of workers to airborne lead by understanding the different concentrations of LBP activities that disturb paint on representative surfaces.

The EPA Resource Conservation and Recovery Act (RCRA), as well as CTDPH, regulate disposal of lead-containing waste. Lead-containing materials that will be impacted during renovation or demolition activities, and result in waste for disposal must either be analyzed using the Toxicity Characteristic Leaching Procedure (TCLP) analysis if lead is determined to be present in non-residential buildings, or be presumed as a hazardous waste. A TCLP sample is a representative sample of the intended waste stream. The results are compared to a threshold value of 5.0 milligrams per liter (mg/L); a result exceeding this value is considered hazardous lead waste. If the result is below the established level, the material is not considered hazardous and may be disposed as general construction debris.

A level of LBP exceeding 1.0 milligrams of lead per square centimeter (mg/cm^2) is considered toxic or dangerous for compliance with residential standards. For purpose of this LBP determination the level of $1.0 \text{ mg}/\text{cm}^2$ has been utilized as a threshold for areas where possible worker exposures may occur.

3.2 XRF Determination Results

The LBP determination indicated consistent painting trends associated with representative building components that may be impacted by potential renovation work. No building components were determined to contain levels of lead (greater than $1.0 \text{ mg}/\text{cm}^2$).

Refer to *Appendix E* for the XRF lead-based paint determination field data sheets.

3.3 Discussion

OSHA published a Lead in Construction Standard (OSHA Lead Standard) Title 29 CFR, Part 1926.62 in May 1993. The OSHA Lead Standard has no set limit for the content of lead in paint below which the standards do not apply. The OSHA Lead Standards are task-based, and derived from airborne exposure and blood lead levels.

The results of this LBP determination are intended to provide guidance to contractors for occupational lead exposure controls. Building components coated with lead levels above industry standards may cause exposures to lead above OSHA standards during proposed demolition and renovation activities. The results of this determination are also intended to provide insight into waste disposal requirements, in accordance with EPA RCRA regulations. At the Client's request, a TCLP sample to characterize the expected waste that may result from possible selective demolition and/or renovation work was not collected as part of this inspection.

3.4 Conclusion and Recommendations

Based on our LBP determination results, LBP is not present on coated building components located on or in the building.

Contractors must be made aware that OSHA has not established a level of lead in a material below which Title 29 CFR, Part 1926.62 does not apply. Contractors shall comply with exposure assessment criteria, interim worker protection, and other requirements of the regulation as necessary to protect workers during any renovation work that will impact lead paint.

For purposes of complying with the U.S. Environmental Protection Agency's Renovation, Repair and Painting Rule (RRP) (40 CFR 745.80 through 92) a Comprehensive Lead Inspection of the entire structure or targeted areas scheduled for renovation is necessary to determine if the RRP rule is applicable. A Comprehensive Lead Inspection includes testing representative coated surfaces of each building component in each room or room equivalent for lead-based paint content. Other types of lead surveys, such as lead paint screening and risk assessments, do not include testing all coated surfaces for lead-based paint and typically do not satisfy the lead-based paint testing requirements of the RRP rule. Since the testing performed was not a comprehensive inspection, the testing will not satisfy applicability requirements of the RRP for any untested surfaces. The testing was performed for surfaces targeted for renovation or demolition as described by the Client. Only the results for those specific surfaces and locations tested within this targeted testing can be utilized to determine applicability requirements for RRP. **Reliance on this report for determining RRP applicability for any other surfaces than those tested is not authorized by Fuss & O'Neill EnviroScience, LLC.**

4 Inventory of Suspect Polychlorinated Biphenyls (PCBs)-Containing Building Materials

4.1 Background

Sampling of building materials for PCBs is presently not mandated by the EPA. However, significant liability risk exists for improperly disposing of PCB- containing waste materials. Recent knowledge and awareness of PCBs within matrices such as caulking, glazing compounds, paints, adhesives and ceiling tiles has become more prevalent, especially amongst remediation contractors, waste haulers, and disposal facilities.

Many property owners have become subject to large changes in schedule, scope, and costs as a result of failure to identify these possible contaminants prior to renovation or demolition. We recommended this testing as part of the work. This information will serve as useful to significant impact and potential requirements for planning required by the EPA which must be implemented if PCBs are identified at a project site.

The EPA requirements apply and require removal of PCBs once identified, regardless of project intent as an unauthorized use of PCBs. Therefore, if buildings are to remain for re-use and PCBs are

identified, the EPA still requires PCB material removal once it is determined that PCBs are present. In addition to identification of source materials containing PCBs, if PCBs are present at certain concentrations, additional sampling and analysis of adjacent surfaces in contact with PCB sources, or which may have been contaminated from a source of PCBs (e.g. soil), must also be performed or remediated.

EPA requirements apply only if PCBs are present in concentrations above a specified level. Presently, PCB-containing materials at concentrations equal to or greater than (\geq) 50 parts per million (ppm), or equivalent units of milligrams per kilogram (mg/kg) are regulated. Note materials containing less than ($<$) 50 ppm may also be regulated unless proven to be an “Excluded PCB Product”. The definition of an Excluded PCB Product includes those products or source of the products containing <50 ppm concentration PCBs that were legally manufactured, processed, distributed in commerce, or used before October 1, 1984.

4.2 Discussion

On October 14, 2016, Mr. Mossey and Ms. Vanderveer conducted a visual inventory of accessible suspect PCB-containing building materials. The inspection involved the quantification of suspect PCB-containing bulk product materials (source materials). At the Client’s request, sampling of suspect materials was not conducted. Following review of the finalized renovation plans for the Site, EnviroScience may recommend that certain materials be sampled and analyzed.

4.3 Conclusions

EnviroScience identified the following suspect PCB-containing building materials during this limited inspection. These materials include the following:

- Exterior roof flashing caulking compounds;
- Exterior window glazing/caulking compounds;
- Exterior door caulking compounds;
- Exterior roofing materials;
- Interior window glazing/caulking compounds;
- Interior door caulking compounds;
- Interior expansion joint caulking compounds;
- Carpet mastic;
- Ceramic tile cove base mastic;
- Backsplash adhesive;
- Sink and counter caulking compounds;
- Painted concrete block walls;
- Painted brick walls;
- Painted gypsum wallboard;

Refer to **Table 3** for the inventory of suspect PCB-containing building materials.

5 PCB-Containing Fluorescent Light Ballasts and Mercury-Containing Lamps

5.1 PCB-Containing Fluorescent Ballasts

Fluorescent light ballasts manufactured prior to 1979 may contain capacitors that contain PCBs. Light ballasts installed as late as 1985 may also contain PCB capacitors. Fluorescent light ballasts that are not labeled as "No-PCBs" must be assumed to contain PCBs, unless proven otherwise by quantitative analysis. Capacitors in fluorescent light ballasts labeled as non-PCB-containing may contain diethylhexyl phthalate (DEHP). DEHP was the primary substitute to replace PCBs for small capacitors in fluorescent light ballasts in use until 1991. DEHP is a toxic substance, a suspected carcinogen, and is listed under EPA RCRA and the Superfund law as a hazardous waste. Therefore, EPA Superfund liability exists for landfilling both PCB and DEHP-containing light ballasts. These listed materials are considered hazardous waste under EPA RCRA, and require special handling and disposal considerations.

On October 14, 2016, EnviroScience representative, Ms. Vanderveer performed a visual inspection of representative fluorescent light fixtures to identify possible PCB-containing light ballasts. The inspection involved visually inspecting labels on representative light ballasts to identify dates of manufacture and labels indicating "No PCBs". Ballasts manufactured after 1991 were not listed as PCB or DEHP-containing ballasts, and were not quantified for disposal.

The light ballasts without a label indicating "No PCBs" are presumed to be PCB-containing waste and must be segregated for proper removal, packaging, transport, and disposal as PCB-containing waste. Those light ballasts labeled as "No PCBs" indicating manufacture dates prior to 1991 are presumed to contain DEHP. DEHP-containing light ballasts must be segregated for proper removal, packaging, transport, and disposal as non-PCB hazardous waste. Note that disposal requirements for DEHP-containing ballasts are slightly varied, and disposal costs are slightly less than PCB-containing light ballasts.

Refer to **Table 4** for the inventory of PCB/DEHP containing light ballasts.

5.2 Mercury-Containing Devices


Fluorescent lamps/tubes are presumed to contain mercury vapor, which is a hazardous substance to both human health and the environment. Thermostatic controls and electrical switch gear may contain a vial or bulb of mercury associated with the control. Mercury-containing equipment is regulated for proper disposal by the EPA RCRA hazardous waste regulations. According to the EPA, mercury lamps are characterized as a Universal Waste. Therefore, fluorescent lamps must be either recycled, or disposed as hazardous waste.

On October 14, 2016, EnviroScience representative Ms. Vanderveer performed an inventory of mercury lamps, thermometers, and mercury switches. These fixtures were inventoried in-place. Refer to **Table 5** for the inventory of mercury containing devices.

Report prepared by Environmental Technician Stacy Vanderveer.

Reviewed by:


Jared D. Smith, CSP
Project Manager


Kathleen C. Pane
Senior Project Manager

Tables

Table 1
Summary of Suspect Asbestos-Containing Materials
300 Washington Street
Middletown, CT

Sample No.	Material Type	NESHAP Category	Sample Location	Asbestos Content	PLM/TEM
10-21-16-SMM-01A	Exterior window glazing		Exterior	ND	PLM/TEM
10-21-16-SMM-01B	Exterior window glazing		Exterior	ND	PLM
10-21-16-SMM-01C	Exterior window glazing		Exterior	ND	PLM
10-21-16-SMM-02A	Exterior window caulk		Exterior	ND	PLM/TEM
10-21-16-SMM-02B	Exterior window caulk		Exterior	ND	PLM
10-21-16-SMM-02C	Exterior window caulk		Exterior	ND	PLM
10-21-16-SMM-03A	Exterior door caulk		Exterior	ND	PLM/TEM
10-21-16-SMM-03B	Exterior door caulk		Exterior	ND	PLM
10-21-16-SMM-03C	Exterior door caulk		Exterior	ND	PLM
10-21-16-SMM-04A	Exterior fascia board	Cat 1 NF	Exterior	15% Chrysotile	PLM
10-21-16-SMM-04B	Exterior fascia board		Exterior	NA/Pos Stop	
10-21-16-SMM-04C	Exterior fascia board		Exterior	NA/Pos Stop	
10-21-16-SMM-05A	2' x 4' Ceiling tile Type I (bird track)		Connector hallway	ND	PLM
10-21-16-SMM-05B	2' x 4' Ceiling tile Type I (bird track)		Connector hallway	ND	PLM
10-21-16-SMM-05C	2' x 4' Ceiling tile Type I (bird track)		Connector hallway	ND	PLM
10-21-16-SMM-06A	2' x 4' Ceiling tile Type II (small gouge and pin hole)		Connector hallway	ND	PLM
10-21-16-SMM-06B	2' x 4' Ceiling tile Type II (small gouge and pin hole)		Stairwell North	ND	PLM
10-21-16-SMM-06C	2' x 4' Ceiling tile Type II (small gouge and pin hole)		1st floor Activity Room	ND	PLM
10-21-16-SMM-07A	2' x 4' Ceiling tile Type III (large gouge and pin hole)		Connector hallway	ND	PLM
10-21-16-SMM-07B	2' x 4' Ceiling tile Type III (large gouge and pin hole)		Activity area	ND	PLM
10-21-16-SMM-07C	2' x 4' Ceiling tile Type III (large gouge and pin hole)		2nd floor 209	ND	PLM
10-21-16-SMM-08A	Interior silver window and door caulk		Connector hallway and front foyer	ND	PLM/TEM
10-21-16-SMM-08B	Interior silver window and door caulk		Connector hallway and front foyer		PLM
10-21-16-SMM-08C	Interior silver window and door caulk		Connector hallway and front foyer		PLM

Sample No.	Material Type	NESHAP Category	Sample Location	Asbestos Content	PLM/TEM
10-21-16-SMM-09A	Brown caulk on brick	Cat 2 NF	Connector hallway at church/north	3% Chrysotile	PLM
10-21-16-SMM-09B	Brown caulk on brick	Cat 2 NF	Connector hallway at church/north	NA/Pos Stop	
10-21-16-SMM-09C	Brown caulk on brick	Cat 2 NF	Connector hallway at church/north	NA/Pos Stop	
10-21-16-SMM-10A	Yellow mixed with brown carpet mastic		Connector hallway	ND	PLM/TEM
10-21-16-SMM-10B	Yellow mixed with brown carpet mastic		Connector hallway	ND	PLM
10-21-16-SMM-10C	Yellow mixed with brown carpet mastic		Stairwell North bottom landing	ND	PLM
10-21-16-SMM-11A	Black window glazing		Connector hallway plate glass windows	ND	PLM/TEM
10-21-16-SMM-11B	Black window glazing		Connector hallway plate glass windows	ND	PLM
10-21-16-SMM-11C	Black window glazing		Connector hallway plate glass windows	ND	PLM
10-21-16-SMM-12A	Gray interior window glazing	Cat 2 NF	Stairwell door windows	2% Chrysotile	PLM
10-21-16-SMM-12B	Gray interior window glazing	Cat 2 NF	Stairwell door windows	NA/Pos Stop	
10-21-16-SMM-12C	Gray interior window glazing	Cat 2 NF	Connector hallway front foyer door side windows	NA/Pos Stop	
10-21-16-SMM-13A	Cabinet backing material		Connector hallway built-in cabinets	ND	PLM
10-21-16-SMM-13B	Cabinet backing material		Connector hallway built-in cabinets	ND	PLM
10-21-16-SMM-13C	Cabinet backing material		Connector hallway built-in cabinets	ND	PLM
10-21-16-SMM-14A	Dark beige carpet mastic		Stairwell north-center and 2nd floor landing	ND	PLM/TEM
10-21-16-SMM-14B	Dark beige carpet mastic		Stairwell north-center and 2nd floor landing	ND	PLM
10-21-16-SMM-14C	Dark beige carpet mastic		Stairwell north-center and 2nd floor landing	ND	PLM
10-21-16-SMM-15A	2' x 2' Ceiling tile Type IV (pin hole and gouge)		1st floor Activity Room	ND	PLM

Sample No.	Material Type	NESHAP Category	Sample Location	Asbestos Content	PLM/TEM
10-21-16-SMM-15B	2' x 2' Ceiling tile Type IV (pin hole and gouge)		1st floor Activity Room	ND	PLM
10-21-16-SMM-15C	2' x 2' Ceiling tile Type IV (pin hole and gouge)		1st floor Activity Room	ND	PLM
10-21-16-SMM-16A	Cork board adhesive		1st floor Activity Room	ND	PLM/TEM
10-21-16-SMM-16B	Cork board adhesive		1st floor Activity Room	ND	PLM
10-21-16-SMM-16C	Cork board adhesive		1st floor Activity Room	ND	PLM
10-21-16-SMM-17A	Adhesive associated with rubber matt flooring		1st floor Activity Room	ND	PLM/TEM
10-21-16-SMM-17B	Adhesive associated with rubber matt flooring		1st floor Activity Room	ND	PLM
10-21-16-SMM-17C	Adhesive associated with rubber matt flooring		Stairwell South	ND	PLM
10-21-16-SMM-18A	Gray sink coating		1st floor Activity Room	ND	PLM/TEM
10-21-16-SMM-18B	Gray sink coating		1st floor Activity Room	ND	PLM
10-21-16-SMM-18C	Gray sink coating		1st floor Activity Room	ND	PLM
10-21-16-SMM-19A	Light beige carpet mastic		1st floor Activity Room	ND	PLM/TEM
10-21-16-SMM-19B	Light beige carpet mastic		Room 102/104	ND	PLM
10-21-16-SMM-19C	Light beige carpet mastic		Room 107/108	ND	PLM
10-21-16-SMM-20A	1' x 1' ceiling tile		Stairwell South bottom landing	ND	PLM
10-21-16-SMM-20B	1' x 1' ceiling tile		Stairwell South bottom landing	ND	PLM
10-21-16-SMM-20C	1' x 1' ceiling tile		Stairwell South bottom landing	ND	PLM
10-21-16-SMM-21A	Dark brown mastic associated with 1' x 1' ceiling tile		Stairwell South bottom landing	ND	PLM/TEM
10-21-16-SMM-21B	Dark brown mastic associated with 1' x 1' ceiling tile		Stairwell South bottom landing	ND	PLM
10-21-16-SMM-21C	Dark brown mastic associated with 1' x 1' ceiling tile		Stairwell South bottom landing	ND	PLM
10-21-16-SMM-22A	Dark brown mastic associated with 6" ceramic cove base tile		Room 105/106 Bathroom	ND	PLM/TEM
10-21-16-SMM-22B	Dark brown mastic associated with 6" ceramic cove base tile		Women's bathroom 1st floor	ND	PLM

Sample No.	Material Type	NESHAP Category	Sample Location	Asbestos Content	PLM/TEM
10-21-16-SMM-22C	Dark brown mastic associated with 6" ceramic cove base tile		Women's bathroom 1st floor	ND	PLM
10-21-16-SMM-23A	Interior door caulking on CMU block		Room 102/104	ND	PLM/TEM
10-21-16-SMM-23B	Interior door caulking on CMU block		Room 102/104	ND	PLM
10-21-16-SMM-23C	Interior door caulking on CMU block		Room 107/108	ND	PLM
10-21-16-SMM-24A	Laminate countertop		Room 105	ND	PLM
10-21-16-SMM-24B	Laminate countertop		Room 105	ND	PLM
10-21-16-SMM-24C	Laminate countertop		Room 105	ND	PLM
10-21-16-SMM-25A	Laminate countertop adhesive		Room 105	ND	PLM/TEM
10-21-16-SMM-25B	Laminate countertop adhesive		Room 105	ND	PLM
10-21-16-SMM-25C	Laminate countertop adhesive		Room 105	ND	PLM
10-21-16-SMM-26A	Laminate backsplash brown adhesive	Cat 2 NF	Room 105	2% Chrysotile	PLM
10-21-16-SMM-26B	Laminate backsplash brown adhesive	Cat 2 NF	Room 105	NA/Pos Stop	
10-21-16-SMM-26C	Laminate backsplash brown adhesive	Cat 2 NF	Room 105	NA/Pos Stop	
10-21-16-SMM-27A	White laminate counter top caulking		Room 105	ND	PLM/TEM
10-21-16-SMM-27B	White laminate counter top caulking		Room 105	ND	PLM
10-21-16-SMM-27C	White laminate counter top caulking		Room 105	ND	PLM
10-21-16-SMM-28A	White sink caulking		Room 105/106 Bathroom	ND	PLM/TEM
10-21-16-SMM-28B	White sink caulking		Room 105/106 Bathroom	ND	PLM
10-21-16-SMM-28C	White sink caulking		Room 102/104 Bathroom	ND	PLM
10-21-16-SMM-29A	Laminate countertop		Room 102-104	ND	PLM
10-21-16-SMM-29B	Laminate countertop		Room 102-104	ND	PLM
10-21-16-SMM-29C	Laminate countertop		Room 102-104	ND	PLM
10-21-16-SMM-30A	Laminate countertop adhesive		Room 102-104	ND	PLM/TEM
10-21-16-SMM-30B	Laminate countertop adhesive		Room 102-104	ND	PLM
10-21-16-SMM-30C	Laminate countertop adhesive		Room 102-104	ND	PLM
10-21-16-SMM-31A	1" ceramic floor tile		Men's Bathroom 1 st floor	ND	PLM
10-21-16-SMM-31B	1" ceramic floor tile		Men's Bathroom 1 st floor	ND	PLM

Sample No.	Material Type	NESHAP Category	Sample Location	Asbestos Content	PLM/TEM
10-21-16-SMM-31C	1" ceramic floor tile		Men's Bathroom 1 st floor	ND	PLM
10-21-16-SMM-32A	Gray thin set associated with 1" floor tiles		Men's Bathroom 1 st floor	ND	PLM
10-21-16-SMM-32B	Gray thin set associated with 1" floor tiles		Men's Bathroom 1 st floor	ND	PLM
10-21-16-SMM-32C	Gray thin set associated with 1" floor tiles		Men's Bathroom 1 st floor	ND	PLM
10-21-16-SMM-33A	Gray grout associated with 1" floor tiles		Men's Bathroom 1 st floor	ND	PLM
10-21-16-SMM-33B	Gray grout associated with 1" floor tiles		Men's Bathroom 1 st floor	ND	PLM
10-21-16-SMM-33C	Gray grout associated with 1" floor tiles		Men's Bathroom 1 st floor	ND	PLM
10-21-16-SMM-34A	Paper backing paper associated with 1" floor tiles		Men's Bathroom 1 st floor	ND	PLM
10-21-16-SMM-34B	Paper backing paper associated with 1" floor tiles		Men's Bathroom 1 st floor	ND	PLM
10-21-16-SMM-34C	Paper backing paper associated with 1" floor tiles		Men's Bathroom 1 st floor	ND	PLM
10-21-16-SMM-35A	Light beige hard and dried carpet mastic		2 nd floor room 205	ND	PLM/TEM
10-21-16-SMM-35B	Light beige hard and dried carpet mastic		2 nd floor room 206	ND	PLM
10-21-16-SMM-35C	Light beige hard and dried carpet mastic		2 nd floor room 208	ND	PLM
10-21-16-SMM-36A	Sheetrock		Room 102-104 covered doorway between room 101	ND	PLM
10-21-16-SMM-36B	Sheetrock		Room 102-104 covered doorway between room 101	ND	PLM
10-21-16-SMM-36C	Sheetrock		Room 102-104 covered doorway between room 101	ND	PLM
10-21-16-SMM-37A	Joint compound		Room 102-104 covered doorway between room 101	ND	PLM
10-21-16-SMM-37B	Joint compound		Room 102-104 covered doorway between room 101	ND	PLM

Sample No.	Material Type	NESHAP Category	Sample Location	Asbestos Content	PLM/TEM
10-21-16-SMM-37C	Joint compound		Room 102-104 covered doorway between room 101	ND	PLM
10-21-16-SMM-38A	Asphalt roof composition		Exterior roof connector	ND	PLM/TEM
10-21-16-SMM-38B	Asphalt roof composition		Exterior roof connector	ND	PLM
10-21-16-SMM-38C	Asphalt roof composition		Exterior roof connector	ND	PLM
10-21-16-SMM-39A	2 layers 1/2" fiberboard		Exterior roof connector	ND	PLM
10-21-16-SMM-39B	2 layers 1/2" fiberboard		Exterior roof connector	ND	PLM
10-21-16-SMM-39C	2 layers 1/2" fiberboard		Exterior roof connector	ND	PLM
10-21-16-SMM-40A	Roofing felts		Exterior roof connector	ND	PLM/TEM
10-21-16-SMM-40B	Roofing felts		Exterior roof connector	ND	PLM
10-21-16-SMM-40C	Roofing felts		Exterior roof connector	ND	PLM
10-21-16-SMM-41A	Fiberboard top layer		Exterior roof connector	ND	PLM
10-21-16-SMM-41B	Fiberboard top layer		Exterior roof connector	ND	PLM
10-21-16-SMM-41C	Fiberboard top layer		Exterior roof connector	ND	PLM
10-21-16-SMM-42A	EPDM adhesive		Exterior roof connector	ND	PLM/TEM
10-21-16-SMM-42B	EPDM adhesive		Exterior roof connector	ND	PLM
10-21-16-SMM-42C	EPDM adhesive		Exterior roof connector	ND	PLM
10-21-16-SMM-43A	Flashing	Cat 2 NF	Exterior roof connector	5% Chrysotile	PLM
10-21-16-SMM-43B	Flashing	Cat 2 NF	Exterior roof connector	NA/Pos Stop	
10-21-16-SMM-43C	Flashing	Cat 2 NF	Exterior roof connector	NA/Pos Stop	
10-21-16-SMM-44A	Flashing caulk		Exterior roof connector	ND	PLM/TEM
10-21-16-SMM-44B	Flashing caulk		Exterior roof connector	ND	PLM

Sample No.	Material Type	NESHAP Category	Sample Location	Asbestos Content	PLM/TEM
10-21-16-SMM-44C	Flashing caulk		Exterior roof connector	ND	PLM
10-21-16-SMM-45A	Lap seam sealant		Exterior roof connector	ND	PLM/TEM
10-21-16-SMM-45B	Lap seam sealant		Exterior roof connector	ND	PLM
10-21-16-SMM-45C	Lap seam sealant		Exterior roof connector	ND	PLM
10-21-16-SMM-46A	Water cut off pipe mastic/caulk		Exterior roof building	ND	PLM/TEM
10-21-16-SMM-46B	Water cut off pipe mastic/caulk		Exterior roof building	ND	PLM
10-21-16-SMM-46C	Water cut off pipe mastic/caulk		Exterior roof building	ND	PLM
10-21-16-SMM-47A	Lap seam sealant caulk		Exterior roof building	ND	PLM/TEM
10-21-16-SMM-47B	Lap seam sealant caulk		Exterior roof building	ND	PLM
10-21-16-SMM-47C	Lap seam sealant caulk		Exterior roof building	ND	PLM
10-21-16-SMM-48A	Residual tar on wood under rubber flashing		Exterior roof building	ND	PLM/TEM
10-21-16-SMM-48B	Residual tar on wood under rubber flashing		Exterior roof building	ND	PLM
10-21-16-SMM-48C	Residual tar on wood under rubber flashing		Exterior roof building	ND	PLM
10-21-16-SMM-49A	Interior window caulking		Room 104	ND	PLM/TEM
10-21-16-SMM-49B	Interior window caulking		Room 104	ND	PLM
10-21-16-SMM-49C	Interior window caulking		Room 210	ND	PLM

Cat 1 NF=Category I Non-Friable Material
 Cat 2 NF=Category II Non-Friable Material
 NA/Pos Stop=Not Analyzed/ Positive Stop
 ND=None Detected

Table 2
Summary of Asbestos-Containing Materials Inventory

Material Type	Location	Asbestos Content	Estimated Total Quantity	Comments
Exterior fascia board	Exterior	15% Chrysotile	800 SF	
Brown caulk on brick	Connector hallway at church/north	3% Chrysotile	20 LF	

Material Type	Location	Asbestos Content	Estimated Total Quantity	Comments
Gray interior window glazing	Stairwell door windows, Connector hallway front foyer door side windows	2% Chrysotile	7 Windows and Doors (110 LF)	7 stairwell doors and 4 side-light foyer door windows
Laminate backsplash brown adhesive	Room 105	2% Chrysotile	8 LF	
Flashing	Exterior roof connector	5% Chrysotile	15 LF	

LF = Linear Feet

SF = Square Feet

Table 3
Suspect PCB-containing Building Materials Inventory

Material Type	Estimated Quantity
Exterior flashing caulking compounds	15 LF
Exterior window glazing compounds	675 LF
Exterior window caulking compounds	675 LF
Exterior door caulking compounds	80 LF
Exterior roofing materials	740 SF
Interior window glazing compounds	110 LF
Interior window caulking compounds	485 LF
Interior door caulking compounds	75 LF
Interior expansion joint caulking compounds	20 LF
Carpet mastic	10,600 SF
Ceramic tile cove base mastic	180 LF
Backsplash adhesive	8 LF
Sink and counter caulks	10 LF
Painted concrete block walls	20,100 SF
Painted brick walls	150 LF
Painted gypsum wallboard	32 SF

Table 4
PCB/DEHP-Containing Light Ballasts Inventory

Type	Estimated Quantity
PCB	226

Table 5
Mercury-Containing Devices Inventory

Type	Estimated Quantity
4' Light Tube	460
Compact Fluorescent Lamp (CFL)	17

Appendix A

Limitations

APPENDIX A

300 Washington Street Middletown, CT

1. This environmental report has been prepared for the exclusive use of ACES (the “Client”), and is subject to, and is issued in connection with the terms and conditions of the original Agreement and all of its provisions. Any use or reliance upon information provided in this report, without the specific written authorization of the Client and Fuss & O’Neill EnviroScience, LLC, (EnviroScience) shall be at the User's individual risk. This report should not be used as an abatement specification. All quantities of materials identified during this limited inspection are approximate.
2. EnviroScience has obtained and relied upon information from multiple sources to form certain conclusions regarding likely environmental issues at and in the vicinity of the subject property in conducting this limited inspection. Except as otherwise noted, no attempt has been made to verify the accuracy or completeness of such information or verify compliance by any party with federal, state or local laws or regulations.
3. EnviroScience has obtained and relied upon laboratory analytical results in conducting the inspection. This information was used to form conclusions regarding the types and quantities of ACM and LBP that must be managed prior to renovation or demolition activities that may disturb these materials at the Site. EnviroScience has not performed an independent review of the reliability of this laboratory data.
4. Unless otherwise noted, only suspect hazardous materials associated within or located on the building (aboveground) were included in this limited inspection. Suspect hazardous materials may exist in inaccessible areas of the building and below the ground surface that were not included in the scope of work of this inspection. EnviroScience cannot guarantee all asbestos or suspect hazardous materials were identified within the areas included in the scope of work. Only visible and accessible areas were included in the scope of work for this limited inspection.
5. The findings, observations and conclusions presented in this report are limited by the scope of services outlined in our original Agreement (August 30, 2016, revised September 1, 2016), which reflects schedule and budgetary constraints imposed by Client. Furthermore, the assessment has been conducted in accordance with generally accepted environmental practices. No other warranty, expressed or implied, is made.
6. The conclusions presented in this report are based solely upon information gathered by EnviroScience to date. Should further environmental or other relevant information be discovered at a later date, the Client should immediately bring the information to the EnviroScience’s attention. Based upon an evaluation and assessment of relevant information, EnviroScience may modify the letter report and its conclusions.

Appendix B

EnviroScience Asbestos Inspector Licenses and Accreditations

1001307 01 AV 0.388 **AUTO T6 I 0864 06040-599246 C01-P01310-I



SCOTT M. MOSSEY
146 HARTFORD RD
C/O FUSS O'NEIL ENVIROSCIENCE
MANCHESTER CT 06040-5992



Dear SCOTT M. MOSSEY,

Attached you will find your validated certificate for the coming year. Should you have any questions about your certificate renewal, please do not hesitate to write or call:

Department of Public Health
P.O. Box 340308
M.S.#12MQA
Hartford, CT 06134-0308

(860) 509-7603
oplc.dph@ct.gov
www.ct.gov/dph/license

Sincerely,

RAUL PINO, MD, MPH, COMMISSIONER
DEPARTMENT OF PUBLIC HEALTH

EMPLOYER'S COPY

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

NAME
SCOTT M. MOSSEY

VALIDATION NO. 03-436516	CERTIFICATE NO. 000283	CURRENT THROUGH 04/30/17
-----------------------------	---------------------------	-----------------------------

PROFESSION
ASBESTOS CONSULTANT-INSP/MGMT PLANNER

SIGNATURE: COMMISSIONER:

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-INSP/MGMT PLANNER

SCOTT M. MOSSEY

CERTIFICATE NO. 000283
CURRENT THROUGH 04/30/17
VALIDATION NO. 03-436516

SIGNATURE: COMMISSIONER:

INSTRUCTIONS:

1. Detach and sign each of the cards on this form.
2. Display the large card in a prominent place in your office or place of business.
3. The wallet card is for you to carry on your person. If you do not wish to carry the wallet card, place it in a secure place.
4. The employer's copy is for persons who must demonstrate current licensure/certification in order to retain employment or privileges. The employer's card is to be presented to the employer and kept by them as a part of your personnel file. Only one copy of this card can be supplied to you.

WALLET CARD

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

NAME
SCOTT M. MOSSEY

VALIDATION NO. 03-436516	CERTIFICATE NO. 000283	CURRENT THROUGH 04/30/17
-----------------------------	---------------------------	-----------------------------

PROFESSION
ASBESTOS CONSULTANT-INSP/MGMT PLANNER

SIGNATURE: COMMISSIONER:

1001307-0001313-00000001 of 0600001-C01-a1d00101-0864-01310

Certificate of Training

Awarded to

SCOTT MOSSEY

*For successful completion of an 8 Hour, 1 Day
Asbestos Inspector & Management Planner
Annual Refresher Training
September 9, 2016*

This training was approved and given in accordance with
Regulations for Connecticut State Agencies
RCSA 20-440 - 1-9 and RCSA 20-441 and meets the
requirements of the EPA Revised MAP under TSCA Title II of 4/4/94

Presented by

**Mystic Air Quality Consultants, Inc.
1204 North Road, Groton, CT 06340 (800) 247-7746**

Certificate Number: IMPR25286

Exam Grade: 100

Exam Date: 09/09/2016

Expiration Date: 09/09/2017



Christopher J. Eident, CIH, CSP, RS



George Williamson, Training Director
Richard Hafley, Training Director

1001306 01 AV 0.388 **AUTO T6 T 0864 06040 599246 C01 P01309.1



STACY VANDERVEER
FUSS AND O'NEILL ENVIROSCIENCE
146 HARTFORD RD
MANCHESTER CT 06040-5992



Dear STACY VANDERVEER,

Attached you will find your validated certificate for the coming year. Should you have any questions about your certificate renewal, please do not hesitate to write or call:

Department of Public Health
P.O. Box 340308
M.S.#12MQA
Hartford, CT 06134-0308

(860) 509-7603
oplc.dph@ct.gov
www.ct.gov/dph/license

Sincerely,

RAUL PINO, MD, MPH, COMMISSIONER
DEPARTMENT OF PUBLIC HEALTH

EMPLOYER'S COPY

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

NAME
STACY VANDERVEER

VALIDATION NO. 03-436138	CERTIFICATE NO. 000866	CURRENT THROUGH 04/30/17
-----------------------------	---------------------------	-----------------------------

PROFESSION
ASBESTOS CONSULTANT-INSPECTOR

SIGNATURE _____ COMMISSIONER _____

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

STACY VANDERVEER

CERTIFICATE NO. 000866
CURRENT THROUGH 04/30/17
VALIDATION NO. 03-436138

SIGNATURE _____ COMMISSIONER _____

INSTRUCTIONS:

1. Detach and sign each of the cards on this form.
2. Display the large card in a prominent place in your office or place of business.
3. The wallet card is for you to carry on your person. If you do not wish to carry the wallet card, place it in a secure place.
4. The employer's copy is for persons who must demonstrate current licensure/certification in order to retain employment or privileges. The employer's card is to be presented to the employer and kept by them as a part of your personnel file. Only one copy of this card can be supplied to you.

WALLET CARD

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

NAME
STACY VANDERVEER

VALIDATION NO. 03-436138	CERTIFICATE NO. 000866	CURRENT THROUGH 04/30/17
-----------------------------	---------------------------	-----------------------------

PROFESSION
ASBESTOS CONSULTANT-INSPECTOR

SIGNATURE _____ COMMISSIONER _____

1001306-0001312-00000001 of 0000001-C01-aid00101-0864-01309

Certificate of Training

This program was presented at
Fuss & O'Neill Enviro Science in
Manchester, CT with the prior
approval of the CTDPH.

Awarded to

STACY VANDERVEER

*For successful completion of a 4 Hour, 1/2 Day
Asbestos Building Inspector
Annual Refresher Training
August 30, 2016*

This training was approved and given in accordance with the
Regulations for Connecticut State Agencies
RCSA 20 - 440 - 1-9 and RCSA 20 - 441 and meets the
requirements of the EPA Revised MAP under TSCA Title II of 4/4/94.

Presented by

**Mystic Air Quality Consultants, Inc.
1204 North Road, Groton, CT 06340 (800) 247-7746**

Certificate Number: ABIRF25269

Exam Grade: 100

Expiration Date: 08/30/2017

Exam Date: 08/30/2016

Richard Welfer

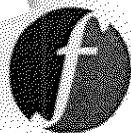
Christopher J. Eident
Christopher J. Eident, CIH, CSP, RS

George Williamson, Training Director

Richard Haffey, Training Director

Appendix C

Asbestos Laboratory Report and Chain-of-Custody Forms



FUSS & O'NEILL
EnviroScience, LLC

Fuss & O'Neill EnviroScience EMSL Customer No. ENVI54

www.fando.com

146 Hartford Road, Manchester, CT 06040

Phone (860) 646-2469

621601601

ASBESTOS BULK SAMPLE CHAIN OF CUSTODY FORM

Sheet 1 of 3Project Name: A.C.E.S Project No. 20160749_A1E Date: 10/14/16Site Address: 300 Washington Street, Middletown, CT Location: School Bldg. and Connector Project Manager: Jared Smith

Sample ID	Sample Location	Type of Material
10-21-16-smm-01A-C	Exterior	Exterior widow glazing
10-21-16-smm-02A-C	Exterior	Exterior widow caulk
10-21-16-smm-03A-C	Exterior	Exterior door caulk
10-21-16-smm-04A-C	Exterior	Exterior fascia board
10-21-16-smm-05A-C	Connector hallway	2' x 4' Ceiling tile Type I (bird track)
10-21-16-smm-06A-C	A-Connector hallway, B- Stairwell North, C- 1 st floor Activity room	2' x 4' Ceiling tile Type II (small gouge and pin hole)
10-21-16-smm-07A-C	A-Connector hallway, B- activity area, C- 2 nd floor 209	2' x 4' Ceiling tile Type III (large gouge and pin hole)
10-21-16-smm-08A-C	Connector hallway and front foyer	Interior silver window and door caulk
10-21-16-smm-09A-C	Connector hallway at church/ north	Brown caulk on brick
10-21-16-smm-10A-C	A & B-Connector hallway, C- stairwell north bottom landing	Yellow mixed with brown carpet mastic
10-21-16-smm-11A-C	Connector hallway plate glass windows	Black window glazing
10-21-16-smm-12A-C	A & B-Stairwell door windows, C-Connector hallway front foyer door side windows	Gray interior window glazing
10-21-16-smm-13A-C	Connector hallway built in cabinets	Cabinet backing material
10-21-16-smm-14A-C	Stairwell north- center and 2 nd floor landing	Dark beige carpet mastic
10-21-16-smm-15A-C	1 st floor Activity room	2' x 2' Ceiling tile Type IV (pin hole and gouge)
10-21-16-smm-16A-C	1 st floor Activity room	Cork board adhesive
10-21-16-smm-17A-C	A & B 1 st floor Activity room, C- stairwell south	Adhesive associated with rubber matt flooring
10-21-16-smm-18A-C	1 st floor Activity room	Gray sink coating
10-21-16-smm-19A-C	A-1 st floor Activity room, B- room 102/104 and C-room 107/108	Light beige carpet mastic
10-21-16-smm-20A-C	Stairwell South bottom landing	1' X 1' ceiling tile
10-21-16-smm-21A-C	Stairwell South bottom landing	Dark brown mastic associated with 1' X 1' ceiling tile
10-21-16-smm-22A-C	A-Bathroom room 105/106, B&C Women's bathroom 1 st floor	Dark brown mastic associated with 6" ceramic cove base tile



FUSS & O'NEILL
EnviroScience, LLC

203
www.fando.com

146 Hartford Road, Manchester, CT 06040

Phone (860) 646-2469

10-21-16-smm-23A-C	A&B- room 102/-104, C- room 107/108	Interior door caulking on CMU block
10-21-16-smm-24A-C	Room 105	Laminate countertop
10-21-16-smm-25A-C	Room 105	Laminate countertop adhesive
10-21-16-smm-26A-C	Room 105	Laminate backsplash brown adhesive
10-21-16-smm-27A-C	Room 105	White laminate counter top caulking
10-21-16-smm-28A-C	A&B- Room 105/106 bathroom, C- Room 102-104 bathroom	White sink caulking
10-21-16-smm-29A-C	Room 102-104	Laminate countertop
10-21-16-smm-30A-C	Room 102-104	Laminate countertop adhesive
10-21-16-smm-31A-C	Men's Bathroom 1st floor	1" ceramic floor tile
10-21-16-smm-32A-C	Men's Bathroom 1st floor	Gray thin set associated with 1" floor tiles
10-21-16-smm-33A-C	Men's Bathroom 1st floor	Gray grout associated with 1" floor tiles
10-21-16-smm-34A-C	Men's Bathroom 1st floor	Paper backing paper associated with 1" floor tiles
10-21-16-smm-35A-C	A- 2nd floor room 205, B- Room 206 and C-208	Light beige hard and dried carpet mastic
10-21-16-smm-36A-C	Room 102-104 covered doorway between room 101	Sheetrock
10-21-16-smm-37A-C	Room 102-104 covered doorway between room 101	Joint compound
10-21-16-smm-38A-C	Exterior roof connector	Asphalt roof composition
10-21-16-smm-39A-C	Exterior roof connector	2 layers 1/2" fiberboard
10-21-16-smm-40A-C	Exterior roof connector	Roofing felts
10-21-16-smm-41A-C	Exterior roof connector	Fiberboard top layer
10-21-16-smm-42A-C	Exterior roof connector	EPDM adhesive
10-21-16-smm-43A-C	Exterior roof connector	Flashing
10-21-16-smm-44A-C	Exterior roof connector	Flashing caulk
10-21-16-smm-45A-C	Exterior roof connector	Lap seam sealant
10-21-16-smm-46A-C	Exterior roof building	Water cut off pipe mastic/caulk
10-21-16-smm-47A-C	Exterior roof building	Lap seam sealant caulk
10-21-16-smm-48A-C	Exterior roof building	Residual tar on wood under rubber flashing
10-21-16-smm-49A-C	A &B- Room 104, C- Room 210	Interior window caulking

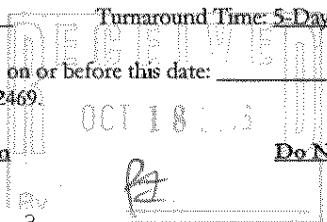
Analysis Method: PLM ITEM Other _____ Turnaround Time: 5-Day _____

Based on the turnaround time indicated above, analyses are due to EnviroScience on or before this date: _____ Please call EnviroScience if analyses will not be completed for requested t/a/t at (860) 646-2469.

FAX Results to: 888-838-1160

Email Results to: jsmith@fando.com

Do Not Mail Hard Copy Report





FUSS & O'NEILL EnviroScience, LLC

343
www.fando.com

146 Hartford Road, Manchester, CT 06040

Phone (860) 646-2469

Total # of Samples: 147

Special Instructions: Stop analysis on first positive sample in each homogeneous set of samples unless otherwise noted. Do not layer samples unless indicated. Do Not Point Count. If NOB group sample results are 0% - < 1% by PLM, analyze only "A" group sample above by TEM NOB, per group, unless you are told otherwise.

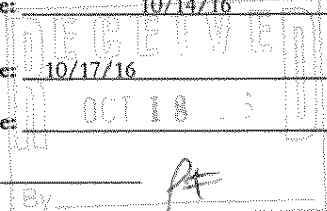
Samples collected by: Scott Mossey *[Signature]* Date: 10/14/16 Time: 1600

Samples Sent by: Scott Mossey *[Signature]* Date: 10/17/16 Time: 1630

Samples Received by: [Signature] Date: OCT 18 10:00 AM Time: 10:00 AM

Shipped To: EMSL State: ME Other _____

Method of Shipment: FedEx Lab Drop Off Other _____





EMSL Analytical, Inc.

161 John Roberts Road South Portland, ME 04106
 Phone/Fax: (207) 517-6921 / (207) 517-6922
<http://www.EMSL.com> / portlandlab@emsl.com

EMSL Order ID: 621601601
 Customer ID: ENVI54
 Customer PO: 20160749.A1E
 Project ID:

Attn: Jared Smith Phone: (860) 646-2469
 Fuss & O'Neill EnviroScience, LLC Fax: (888) 838-1160
 146 Hartford Road Collected: 10/14/2016
 Manchester, CT 06040 Received: 10/18/2016
 Analyzed: 10/25/2016

Proj: A.C.E.S 20160749.A1E

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116

Client Sample ID: 10-21-16-SMM-01A **Lab Sample ID:** 621601601-0001
Sample Description: EXTERIOR EXTERIOR WINDOW GLAZING

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Gray	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	Gray	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-01B **Lab Sample ID:** 621601601-0002
Sample Description: EXTERIOR EXTERIOR WINDOW GLAZING

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Gray	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-01C **Lab Sample ID:** 621601601-0003
Sample Description: EXTERIOR EXTERIOR WINDOW GLAZING

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Gray	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-02A **Lab Sample ID:** 621601601-0004
Sample Description: EXTERIOR EXTERIOR WINDOW CAULK

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Gray	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	Gray	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-02B **Lab Sample ID:** 621601601-0005
Sample Description: EXTERIOR EXTERIOR WINDOW CAULK

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Gray	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-02C **Lab Sample ID:** 621601601-0006
Sample Description: EXTERIOR EXTERIOR WINDOW CAULK

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Gray	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-03A **Lab Sample ID:** 621601601-0007
Sample Description: EXTERIOR EXTERIOR DOOR CAULK

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Gray	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	Gray	0.0%	100%	None Detected	



EMSL Analytical, Inc.

161 John Roberts Road South Portland, ME 04106
 Phone/Fax: (207) 517-6921 / (207) 517-6922
<http://www.EMSL.com> / portlandlab@emsl.com

EMSL Order ID: 621601601
 Customer ID: ENVI54
 Customer PO: 20160749.A1E
 Project ID:

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116

Client Sample ID: 10-21-16-SMM-03B **Lab Sample ID:** 621601601-0008
Sample Description: EXTERIOR EXTERIOR DOOR CAULK

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Gray	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-03C **Lab Sample ID:** 621601601-0009
Sample Description: EXTERIOR EXTERIOR DOOR CAULK

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Gray	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-04A **Lab Sample ID:** 621601601-0010
Sample Description: EXTERIOR EXTERIOR DOOR FASCIA BOARD

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Gray	0%	85%	15% Chrysotile	

Client Sample ID: 10-21-16-SMM-04B **Lab Sample ID:** 621601601-0011
Sample Description: EXTERIOR EXTERIOR DOOR FASCIA BOARD

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016					Positive Stop (Not Analyzed)

Client Sample ID: 10-21-16-SMM-04C **Lab Sample ID:** 621601601-0012
Sample Description: EXTERIOR EXTERIOR DOOR FASCIA BOARD

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016					Positive Stop (Not Analyzed)

Client Sample ID: 10-21-16-SMM-05A **Lab Sample ID:** 621601601-0013
Sample Description: CONNECTOR HALL WAY 2'X4' CEILING TILE TYPE I (BIRD TRACK)

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Gray	85%	15%	None Detected	

Client Sample ID: 10-21-16-SMM-05B **Lab Sample ID:** 621601601-0014
Sample Description: CONNECTOR HALL WAY 2'X4' CEILING TILE TYPE I (BIRD TRACK)

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Gray	80%	20%	None Detected	

Client Sample ID: 10-21-16-SMM-05C **Lab Sample ID:** 621601601-0015
Sample Description: CONNECTOR HALL WAY 2'X4' CEILING TILE TYPE I (BIRD TRACK)

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Gray	85%	15%	None Detected	



EMSL Analytical, Inc.

161 John Roberts Road South Portland, ME 04106
 Phone/Fax: (207) 517-6921 / (207) 517-6922
<http://www.EMSL.com> / portlandlab@emsl.com

EMSL Order ID: 621601601
 Customer ID: ENVI54
 Customer PO: 20160749.A1E
 Project ID:

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116

Client Sample ID: 10-21-16-SMM-06A **Lab Sample ID:** 621601601-0016
Sample Description: CONNECTOR HALLWAY 2X4 CEILING TILE TYPE II (SMALL GOUGE AND PIN HOLE)

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Gray	95%	5%	None Detected	

Client Sample ID: 10-21-16-SMM-06B **Lab Sample ID:** 621601601-0017
Sample Description: STAIRWELL NORTH 2X4 CEILING TILE TYPE II (SMALL GOUGE AND PIN HOLE)

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Gray	90%	10%	None Detected	

Client Sample ID: 10-21-16-SMM-06C **Lab Sample ID:** 621601601-0018
Sample Description: 1ST FLOOR ACTIVITY ROOM 2X4 CEILING TILE TYPE II (SMALL GOUGE AND PIN HOLE)

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Gray	85%	15%	None Detected	

Client Sample ID: 10-21-16-SMM-07A **Lab Sample ID:** 621601601-0019
Sample Description: CONNECTOR HALLWAY 2X4 CEILING TILE TYPE III (LARGE GOUGE AND PIN HOLE)

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Gray	80%	20%	None Detected	

Client Sample ID: 10-21-16-SMM-07B **Lab Sample ID:** 621601601-0020
Sample Description: ACTIVITY AREA 2X4 CEILING TILE TYPE III (LARGE GOUGE AND PIN HOLE)

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Gray	80%	20%	None Detected	

Client Sample ID: 10-21-16-SMM-07C **Lab Sample ID:** 621601601-0021
Sample Description: 2ND FLOOR 2092X4 CEILING TILE TYPE III (LARGE GOUGE AND PIN HOLE)

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Gray	85%	15%	None Detected	

Client Sample ID: 10-21-16-SMM-08A **Lab Sample ID:** 621601601-0022
Sample Description: CONNECTOR HALLWAY AND FRONT FOYER INTERIOR SILVER WINDOW AND DOOR CAULK

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Gray	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	Gray	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-08B **Lab Sample ID:** 621601601-0023
Sample Description: CONNECTOR HALLWAY AND FRONT FOYER INTERIOR SILVER WINDOW AND DOOR CAULK

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Gray	0%	100%	None Detected	



EMSL Analytical, Inc.

161 John Roberts Road South Portland, ME 04106
 Phone/Fax: (207) 517-6921 / (207) 517-6922
<http://www.EMSL.com> / portlandlab@emsl.com

EMSL Order ID: 621601601
 Customer ID: ENVI54
 Customer PO: 20160749.A1E
 Project ID:

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116

Client Sample ID: 10-21-16-SMM-08C **Lab Sample ID:** 621601601-0024
Sample Description: CONNECTOR HALLWAY AND FRONT FOYER INTERIOR SILVER WINDOW AND DOOR CAULK

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Gray	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-09A **Lab Sample ID:** 621601601-0025
Sample Description: CONNECTOR HALLWAY AT CHURCH/ NORTH BROWN CAULK ON BRICK

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Gray	0%	97%	3% Chrysotile	

Client Sample ID: 10-21-16-SMM-09B **Lab Sample ID:** 621601601-0026
Sample Description: CONNECTOR HALLWAY AT CHURCH/ NORTH BROWN CAULK ON BRICK

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016				Positive Stop (Not Analyzed)	

Client Sample ID: 10-21-16-SMM-09C **Lab Sample ID:** 621601601-0027
Sample Description: CONNECTOR HALLWAY AT CHURCH/ NORTH BROWN CAULK ON BRICK

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016				Positive Stop (Not Analyzed)	

Client Sample ID: 10-21-16-SMM-10A **Lab Sample ID:** 621601601-0028
Sample Description: CONNECTOR HALLWAY YELLOW MIXED WITH BROWN CARPET MASTIC

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Yellow	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	Yellow	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-10B **Lab Sample ID:** 621601601-0029
Sample Description: CONNECTOR HALLWAY YELLOW MIXED WITH BROWN CARPET MASTIC

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Yellow	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-10C **Lab Sample ID:** 621601601-0030
Sample Description: STAIRWELL NORTH BOTTOM LANDING YELLOW MIXED WITH BROWN CARPET MASTIC

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Yellow	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-11A **Lab Sample ID:** 621601601-0031
Sample Description: CONNECTOR HALLWAY PLATE GLASS WINDOWS BLACK WINDOW GLAZING

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Black	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	Black	0.0%	100%	None Detected	



EMSL Analytical, Inc.

161 John Roberts Road South Portland, ME 04106
 Phone/Fax: (207) 517-6921 / (207) 517-6922
<http://www.EMSL.com> / portlandlab@emsl.com

EMSL Order ID: 621601601
 Customer ID: ENVI54
 Customer PO: 20160749.A1E
 Project ID:

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116

Client Sample ID: 10-21-16-SMM-11B **Lab Sample ID:** 621601601-0032

Sample Description: CONNECTOR HALLWAY PLATE GLASS WINDOWS BLACK WINDOW GLAZING

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Black	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-11C **Lab Sample ID:** 621601601-0033

Sample Description: CONNECTOR HALLWAY PLATE GLASS WINDOWS BLACK WINDOW GLAZING

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Black	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-12A **Lab Sample ID:** 621601601-0034

Sample Description: STAIRWELL DOOR WINDOWS GRAY INTERIOR WINDOW GLAZING

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Tan	0%	98%	2% Chrysotile	

Client Sample ID: 10-21-16-SMM-12B **Lab Sample ID:** 621601601-0035

Sample Description: STAIRWELL DOOR WINDOWS GRAY INTERIOR WINDOW GLAZING

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016					Positive Stop (Not Analyzed)

Client Sample ID: 10-21-16-SMM-12C **Lab Sample ID:** 621601601-0036

Sample Description: CONNECTOR HALLWAY FRONT FOYER DOOR SIDE WINDOWS GRAY INTERIOR WINDOW GLAZING

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016					Positive Stop (Not Analyzed)

Client Sample ID: 10-21-16-SMM-13A **Lab Sample ID:** 621601601-0037

Sample Description: CONNECTOR HALLWAY BUILT IN CABINETS CABINET BACKING MATERIAL

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Brown	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-13B **Lab Sample ID:** 621601601-0038

Sample Description: CONNECTOR HALLWAY BUILT IN CABINETS CABINET BACKING MATERIAL

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Brown	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-13C **Lab Sample ID:** 621601601-0039

Sample Description: CONNECTOR HALLWAY BUILT IN CABINETS CABINET BACKING MATERIAL

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Brown	0%	100%	None Detected	



EMSL Analytical, Inc.

161 John Roberts Road South Portland, ME 04106
 Phone/Fax: (207) 517-6921 / (207) 517-6922
<http://www.EMSL.com> / portlandlab@emsl.com

EMSL Order ID: 621601601
 Customer ID: ENVI54
 Customer PO: 20160749.A1E
 Project ID:

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116

Client Sample ID: 10-21-16-SMM-14A **Lab Sample ID:** 621601601-0040

Sample Description: STAIRWELL NORTH CENTER AND 2ND FLOOR LANDING DARK BEIGE CARPET MASTIC

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Yellow	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	Yellow	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-14B **Lab Sample ID:** 621601601-0041

Sample Description: STAIRWELL NORTH CENTER AND 2ND FLOOR LANDING DARK BEIGE CARPET MASTIC

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Yellow	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-14C **Lab Sample ID:** 621601601-0042

Sample Description: STAIRWELL NORTH CENTER AND 2ND FLOOR LANDING DARK BEIGE CARPET MASTIC

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Yellow	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-15A **Lab Sample ID:** 621601601-0043

Sample Description: 1ST FLOOR ACTIVITY ROOM 2X2 CEILING TILE TYPE IV (PIN HOLE AND GOUGE)

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Gray	90%	10%	None Detected	

Client Sample ID: 10-21-16-SMM-15B **Lab Sample ID:** 621601601-0044

Sample Description: 1ST FLOOR ACTIVITY ROOM 2X2 CEILING TILE TYPE IV (PIN HOLE AND GOUGE)

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Gray	90%	10%	None Detected	

Client Sample ID: 10-21-16-SMM-15C **Lab Sample ID:** 621601601-0045

Sample Description: 1ST FLOOR ACTIVITY ROOM 2X2 CEILING TILE TYPE IV (PIN HOLE AND GOUGE)

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Gray	85%	15%	None Detected	

Client Sample ID: 10-21-16-SMM-16A **Lab Sample ID:** 621601601-0046

Sample Description: 1ST FLOOR ACTIVITY ROOM CORK BOARD ADHESIVE

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Yellow	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	Yellow	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-16B **Lab Sample ID:** 621601601-0047

Sample Description: 1ST FLOOR ACTIVITY ROOM CORK BOARD ADHESIVE

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Yellow	0%	100%	None Detected	



EMSL Analytical, Inc.

161 John Roberts Road South Portland, ME 04106
 Phone/Fax: (207) 517-6921 / (207) 517-6922
<http://www.EMSL.com> / portlandlab@emsl.com

EMSL Order ID: 621601601
 Customer ID: ENVI54
 Customer PO: 20160749.A1E
 Project ID:

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116

Client Sample ID: 10-21-16-SMM-16C **Lab Sample ID:** 621601601-0048

Sample Description: 1ST FLOOR ACTIVITY ROOM CORK BOARD ADHESIVE

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Yellow	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-17A **Lab Sample ID:** 621601601-0049

Sample Description: 1ST FLOOR ACTIVITY ROOM ADHESIVE ASSOCIATED WITH RUBBER MAT FLOORING

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Yellow	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	Yellow	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-17B **Lab Sample ID:** 621601601-0050

Sample Description: 1ST FLOOR ACTIVITY ROOM ADHESIVE ASSOCIATED WITH RUBBER MAT FLOORING

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Yellow	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-17C **Lab Sample ID:** 621601601-0051

Sample Description: STAIRWELL SOUTH ADHESIVE ASSOCIATED WITH RUBBER MAT FLOORING

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Yellow	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-18A **Lab Sample ID:** 621601601-0052

Sample Description: 1ST FLOOR ACTIVITY ROOM GRAY SINK COATING

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Gray	15%	85%	None Detected	
TEM Grav. Reduction	10/25/2016	Gray	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-18B **Lab Sample ID:** 621601601-0053

Sample Description: 1ST FLOOR ACTIVITY ROOM GRAY SINK COATING

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Gray	15%	85%	None Detected	

Client Sample ID: 10-21-16-SMM-18C **Lab Sample ID:** 621601601-0054

Sample Description: 1ST FLOOR ACTIVITY ROOM GRAY SINK COATING

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Gray	20%	80%	None Detected	

Client Sample ID: 10-21-16-SMM-19A **Lab Sample ID:** 621601601-0055

Sample Description: 1ST FLOOR ACTIVITY ROOM LIGHT BEIGE CARPET MASTIC

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Yellow	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	Yellow	0.0%	100%	None Detected	



EMSL Analytical, Inc.

161 John Roberts Road South Portland, ME 04106
 Phone/Fax: (207) 517-6921 / (207) 517-6922
<http://www.EMSL.com> / portlandlab@emsl.com

EMSL Order ID: 621601601
 Customer ID: ENVI54
 Customer PO: 20160749.A1E
 Project ID:

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116

Client Sample ID: 10-21-16-SMM-19B **Lab Sample ID:** 621601601-0056

Sample Description: ROOM 102/104 LIGHT BEIGE CARPET MASTIC

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Yellow	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-19C **Lab Sample ID:** 621601601-0057

Sample Description: ROOM 107/108 LIGHT BEIGE CARPET MASTIC

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Yellow	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-20A **Lab Sample ID:** 621601601-0058

Sample Description: STAIRWELL SOUTH BOTTOM LANDING 1X1 CEILING TILE

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Gray	90%	10%	None Detected	

Client Sample ID: 10-21-16-SMM-20B **Lab Sample ID:** 621601601-0059

Sample Description: STAIRWELL SOUTH BOTTOM LANDING 1X1 CEILING TILE

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/20/2016	Gray	90%	10%	None Detected	

Client Sample ID: 10-21-16-SMM-20C **Lab Sample ID:** 621601601-0060

Sample Description: STAIRWELL SOUTH BOTTOM LANDING 1X1 CEILING TILE

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Gray	85%	15%	None Detected	

Client Sample ID: 10-21-16-SMM-21A **Lab Sample ID:** 621601601-0061

Sample Description: STAIRWELL SOUTH BOTTOM LANDING DARK BROWN MASTIC ASSOCIATED 1X1 CEILING TILE

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Brown	10%	90%	None Detected	
TEM Grav. Reduction	10/25/2016	Brown	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-21B **Lab Sample ID:** 621601601-0062

Sample Description: STAIRWELL SOUTH BOTTOM LANDING DARK BROWN MASTIC ASSOCIATED 1X1 CEILING TILE

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Brown	10%	90%	None Detected	

Client Sample ID: 10-21-16-SMM-21C **Lab Sample ID:** 621601601-0063

Sample Description: STAIRWELL SOUTH BOTTOM LANDING DARK BROWN MASTIC ASSOCIATED 1X1 CEILING TILE

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Brown	8%	92%	None Detected	



EMSL Analytical, Inc.

161 John Roberts Road South Portland, ME 04106
 Phone/Fax: (207) 517-6921 / (207) 517-6922
<http://www.EMSL.com> / portlandlab@emsl.com

EMSL Order ID: 621601601
 Customer ID: ENVI54
 Customer PO: 20160749.A1E
 Project ID:

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116

Client Sample ID: 10-21-16-SMM-22A **Lab Sample ID:** 621601601-0064

Sample Description: BATHROOM ROOM 105/106 DARK BROWN MASTIC ASSOCIATED WITH 6" CERAMIC COVE BASE TILE

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Yellow	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	Yellow	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-22B **Lab Sample ID:** 621601601-0065

Sample Description: WOMENS BATHROOM 1ST FLOOR DARK BROWN MASTIC ASSOCIATED WITH 6" CERAMIC COVE BASE TILE

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Yellow	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-22C **Lab Sample ID:** 621601601-0066

Sample Description: WOMENS BATHROOM 1ST FLOOR DARK BROWN MASTIC ASSOCIATED WITH 6" CERAMIC COVE BASE TILE

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/24/2016	Yellow	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-23A **Lab Sample ID:** 621601601-0067

Sample Description: ROOM 102/-104 INTERIOR DOOR CAULKING ON CMU BLOCK

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	White	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	White	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-23B **Lab Sample ID:** 621601601-0068

Sample Description: ROOM 102/-104 INTERIOR DOOR CAULKING ON CMU BLOCK

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	White	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-23C **Lab Sample ID:** 621601601-0069

Sample Description: ROOM 107/108 INTERIOR DOOR CAULKING ON CMU BLOCK

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/24/2016	White	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-24A **Lab Sample ID:** 621601601-0070

Sample Description: ROOM 105 LAMINATE COUNTERTOP

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Brown	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-24B **Lab Sample ID:** 621601601-0071

Sample Description: ROOM 105 LAMINATE COUNTERTOP

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Brown	0%	100%	None Detected	



EMSL Analytical, Inc.

161 John Roberts Road South Portland, ME 04106
 Phone/Fax: (207) 517-6921 / (207) 517-6922
<http://www.EMSL.com> / portlandlab@emsl.com

EMSL Order ID: 621601601
 Customer ID: ENVI54
 Customer PO: 20160749.A1E
 Project ID:

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116

Client Sample ID: 10-21-16-SMM-24C **Lab Sample ID:** 621601601-0072
Sample Description: ROOM 105 LAMINATE COUNTERTOP

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/24/2016	Brown	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-25A **Lab Sample ID:** 621601601-0073
Sample Description: ROOM 105 LAMINATE COUNTERTOP ADHESIVE

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Yellow	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	Yellow	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-25B **Lab Sample ID:** 621601601-0074
Sample Description: ROOM 105 LAMINATE COUNTERTOP ADHESIVE

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Yellow	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-25C **Lab Sample ID:** 621601601-0075
Sample Description: ROOM 105 LAMINATE COUNTERTOP ADHESIVE

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/24/2016	Yellow	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-26A **Lab Sample ID:** 621601601-0076
Sample Description: ROOM 105 LAMINATE BACKSPLASH BROWN ADHESIVE

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Brown	0%	98%	2% Chrysotile	

Client Sample ID: 10-21-16-SMM-26B **Lab Sample ID:** 621601601-0077
Sample Description: ROOM 105 LAMINATE BACKSPLASH BROWN ADHESIVE

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016					Positive Stop (Not Analyzed)

Client Sample ID: 10-21-16-SMM-26C **Lab Sample ID:** 621601601-0078
Sample Description: ROOM 105 LAMINATE BACKSPLASH BROWN ADHESIVE

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016					Positive Stop (Not Analyzed)

Client Sample ID: 10-21-16-SMM-27A **Lab Sample ID:** 621601601-0079
Sample Description: ROOM 105 WHITE LAMINATE COUNTERTOP CAULKING

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	White	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	White	0.0%	100%	None Detected	



EMSL Analytical, Inc.

161 John Roberts Road South Portland, ME 04106
 Phone/Fax: (207) 517-6921 / (207) 517-6922
<http://www.EMSL.com> / portlandlab@emsl.com

EMSL Order ID: 621601601
 Customer ID: ENVI54
 Customer PO: 20160749.A1E
 Project ID:

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116

Client Sample ID: 10-21-16-SMM-27B **Lab Sample ID:** 621601601-0080

Sample Description: ROOM 105 WHITE LAMINATE COUNTERTOP CAULKING

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	White	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-27C **Lab Sample ID:** 621601601-0081

Sample Description: ROOM 105 WHITE LAMINATE COUNTERTOP CAULKING

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/24/2016	White	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-28A **Lab Sample ID:** 621601601-0082

Sample Description: ROOM 105/ 106 BATHROOM WHITE SINK CAULKING

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	White	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	White	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-28B **Lab Sample ID:** 621601601-0083

Sample Description: ROOM 105/ 106 BATHROOM WHITE SINK CAULKING

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	White	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-28C **Lab Sample ID:** 621601601-0084

Sample Description: ROOM 102/ 104 BATHROOM WHITE SINK CAULKING

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/24/2016	White	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-29A **Lab Sample ID:** 621601601-0085

Sample Description: ROOM 102-104 LAMINATE COUNTERTOP

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Brown	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-29B **Lab Sample ID:** 621601601-0086

Sample Description: ROOM 102-104 LAMINATE COUNTERTOP

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Brown	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-29C **Lab Sample ID:** 621601601-0087

Sample Description: ROOM 102-104 LAMINATE COUNTERTOP

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/24/2016	Brown	0%	100%	None Detected	



EMSL Analytical, Inc.

161 John Roberts Road South Portland, ME 04106
 Phone/Fax: (207) 517-6921 / (207) 517-6922
<http://www.EMSL.com> / portlandlab@emsl.com

EMSL Order ID: 621601601
 Customer ID: ENVI54
 Customer PO: 20160749.A1E
 Project ID:

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116

Client Sample ID: 10-21-16-SMM-30A **Lab Sample ID:** 621601601-0088

Sample Description: ROOM 102-104 LAMINATE COUNTERTOP ADHESIVE

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/24/2016	Tan	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	Tan	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-30B **Lab Sample ID:** 621601601-0089

Sample Description: ROOM 102-104 LAMINATE COUNTERTOP ADHESIVE

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/24/2016	Tan	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-30C **Lab Sample ID:** 621601601-0090

Sample Description: ROOM 102-104 LAMINATE COUNTERTOP ADHESIVE

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/24/2016	Yellow	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-31A **Lab Sample ID:** 621601601-0091

Sample Description: MENS BATHROOM 1ST FLOOR 1" CERAMIC FLOOR TILE

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Gray	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-31B **Lab Sample ID:** 621601601-0092

Sample Description: MENS BATHROOM 1ST FLOOR 1" CERAMIC FLOOR TILE

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Gray	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-31C **Lab Sample ID:** 621601601-0093

Sample Description: MENS BATHROOM 1ST FLOOR 1" CERAMIC FLOOR TILE

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/24/2016	Gray	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-32A **Lab Sample ID:** 621601601-0094

Sample Description: MENS BATHROOM 1ST FLOOR GRAY THIN SET ASSOCIATED WITH 1" FLOOR TILES

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Gray	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-32B **Lab Sample ID:** 621601601-0095

Sample Description: MENS BATHROOM 1ST FLOOR GRAY THIN SET ASSOCIATED WITH 1" FLOOR TILES

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Gray	0%	100%	None Detected	



EMSL Analytical, Inc.

161 John Roberts Road South Portland, ME 04106
 Phone/Fax: (207) 517-6921 / (207) 517-6922
<http://www.EMSL.com> / portlandlab@emsl.com

EMSL Order ID: 621601601
 Customer ID: ENVI54
 Customer PO: 20160749.A1E
 Project ID:

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116

Client Sample ID: 10-21-16-SMM-32C **Lab Sample ID:** 621601601-0096

Sample Description: MENS BATHROOM 1ST FLOOR GRAY THIN SET ASSOCIATED WITH 1" FLOOR TILES

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/24/2016	Gray	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-33A **Lab Sample ID:** 621601601-0097

Sample Description: MENS BATHROOM 1ST FLOOR GRAY GROUT ASSOCIATED WITH 1" FLOOR TILES

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Gray	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-33B **Lab Sample ID:** 621601601-0098

Sample Description: MENS BATHROOM 1ST FLOOR GRAY GROUT ASSOCIATED WITH 1" FLOOR TILES

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Gray	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-33C **Lab Sample ID:** 621601601-0099

Sample Description: MENS BATHROOM 1ST FLOOR GRAY GROUT ASSOCIATED WITH 1" FLOOR TILES

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/24/2016	Gray	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-34A **Lab Sample ID:** 621601601-0100

Sample Description: MENS BATHROOM 1ST FLOOR PAPER BACKING PAPER ASSOCIATED WITH 1" FLOOR TILES

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Tan	95%	5%	None Detected	

Client Sample ID: 10-21-16-SMM-34B **Lab Sample ID:** 621601601-0101

Sample Description: MENS BATHROOM 1ST FLOOR PAPER BACKING PAPER ASSOCIATED WITH 1" FLOOR TILES

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Tan	95%	5%	None Detected	

Client Sample ID: 10-21-16-SMM-34C **Lab Sample ID:** 621601601-0102

Sample Description: MENS BATHROOM 1ST FLOOR PAPER BACKING PAPER ASSOCIATED WITH 1" FLOOR TILES

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/24/2016	Tan	95%	5%	None Detected	

Client Sample ID: 10-21-16-SMM-35A **Lab Sample ID:** 621601601-0103

Sample Description: 2ND FLOOR ROOM 205 LIGHT BEIGE HARD AND DRIED CARPET MASTIC

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Yellow/Beige	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	Yellow/Beige	0.0%	100%	None Detected	



EMSL Analytical, Inc.

161 John Roberts Road South Portland, ME 04106
 Phone/Fax: (207) 517-6921 / (207) 517-6922
<http://www.EMSL.com> / portlandlab@emsl.com

EMSL Order ID: 621601601
 Customer ID: ENVI54
 Customer PO: 20160749.A1E
 Project ID:

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116

Client Sample ID: 10-21-16-SMM-35B **Lab Sample ID:** 621601601-0104

Sample Description: ROOM 206 LIGHT BEIGE HARD AND DRIED CARPET MASTIC

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Yellow	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-35C **Lab Sample ID:** 621601601-0105

Sample Description: ROOM 208 LIGHT BEIGE HARD AND DRIED CARPET MASTIC

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/24/2016	Yellow	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-36A **Lab Sample ID:** 621601601-0106

Sample Description: ROOM 102-104 COVERED DOORWAY BETWEEN 101 SHEETROCK

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	White	10%	90%	None Detected	

Client Sample ID: 10-21-16-SMM-36B **Lab Sample ID:** 621601601-0107

Sample Description: ROOM 102-104 COVERED DOORWAY BETWEEN 101 SHEETROCK

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	White	10%	90%	None Detected	

Client Sample ID: 10-21-16-SMM-36C **Lab Sample ID:** 621601601-0108

Sample Description: ROOM 102-104 COVERED DOORWAY BETWEEN 101 SHEETROCK

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/24/2016	White	5%	95%	None Detected	

Client Sample ID: 10-21-16-SMM-37A **Lab Sample ID:** 621601601-0109

Sample Description: ROOM 102-104 COVERED DOORWAY BETWEEN 101 JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	White	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-37B **Lab Sample ID:** 621601601-0110

Sample Description: ROOM 102-104 COVERED DOORWAY BETWEEN 101 JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	White	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-37C **Lab Sample ID:** 621601601-0111

Sample Description: ROOM 102-104 COVERED DOORWAY BETWEEN 101 JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/24/2016	White	0%	100%	None Detected	



EMSL Analytical, Inc.

161 John Roberts Road South Portland, ME 04106
 Phone/Fax: (207) 517-6921 / (207) 517-6922
<http://www.EMSL.com> / portlandlab@emsl.com

EMSL Order ID: 621601601
 Customer ID: ENVI54
 Customer PO: 20160749.A1E
 Project ID:

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116

Client Sample ID: 10-21-16-SMM-38A **Lab Sample ID:** 621601601-0112

Sample Description: EXTERIOR ROOF CONNECTOR ASPHALT ROOF COMPOSITION

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Black	10%	90%	None Detected	
TEM Grav. Reduction	10/25/2016	Black	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-38B **Lab Sample ID:** 621601601-0113

Sample Description: EXTERIOR ROOF CONNECTOR ASPHALT ROOF COMPOSITION

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Brown/Black	11%	89%	None Detected	

Client Sample ID: 10-21-16-SMM-38C **Lab Sample ID:** 621601601-0114

Sample Description: EXTERIOR ROOF CONNECTOR ASPHALT ROOF COMPOSITION

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/24/2016	Black	10%	90%	None Detected	

Client Sample ID: 10-21-16-SMM-39A **Lab Sample ID:** 621601601-0115

Sample Description: EXTERIOR ROOF CONNECTOR 2 LAYERS 1/2" FIBERBOARD

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Brown	90%	10%	None Detected	

Client Sample ID: 10-21-16-SMM-39B **Lab Sample ID:** 621601601-0116

Sample Description: EXTERIOR ROOF CONNECTOR 2 LAYERS 1/2" FIBERBOARD

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Brown	90%	10%	None Detected	

Client Sample ID: 10-21-16-SMM-39C **Lab Sample ID:** 621601601-0117

Sample Description: EXTERIOR ROOF CONNECTOR 2 LAYERS 1/2" FIBERBOARD

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/24/2016	Brown	90%	10%	None Detected	

Client Sample ID: 10-21-16-SMM-40A **Lab Sample ID:** 621601601-0118

Sample Description: EXTERIOR ROOF CONNECTOR ROOFING FELTS

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Black	20%	80%	None Detected	
TEM Grav. Reduction	10/25/2016	Black	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-40B **Lab Sample ID:** 621601601-0119

Sample Description: EXTERIOR ROOF CONNECTOR ROOFING FELTS

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Black	25%	75%	None Detected	



EMSL Analytical, Inc.

161 John Roberts Road South Portland, ME 04106
 Phone/Fax: (207) 517-6921 / (207) 517-6922
<http://www.EMSL.com> / portlandlab@emsl.com

EMSL Order ID: 621601601
 Customer ID: ENVI54
 Customer PO: 20160749.A1E
 Project ID:

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116

Client Sample ID: 10-21-16-SMM-40C **Lab Sample ID:** 621601601-0120
Sample Description: EXTERIOR ROOF CONNECTOR ROOFING FELTS

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/24/2016	Black	15%	85%	None Detected	

Client Sample ID: 10-21-16-SMM-41A **Lab Sample ID:** 621601601-0121
Sample Description: EXTERIOR ROOF CONNECTOR FIBERBOARD TOP LAYER

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Tan	98%	2%	None Detected	

Client Sample ID: 10-21-16-SMM-41B **Lab Sample ID:** 621601601-0122
Sample Description: EXTERIOR ROOF CONNECTOR FIBERBOARD TOP LAYER

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Tan	98%	2%	None Detected	

Client Sample ID: 10-21-16-SMM-41C **Lab Sample ID:** 621601601-0123
Sample Description: EXTERIOR ROOF CONNECTOR FIBERBOARD TOP LAYER

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/24/2016	Gray	95%	5%	None Detected	

Client Sample ID: 10-21-16-SMM-42A **Lab Sample ID:** 621601601-0124
Sample Description: EXTERIOR ROOF CONNECTOR EPDM ADHESIVE

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Black	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	Black	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-42B **Lab Sample ID:** 621601601-0125
Sample Description: EXTERIOR ROOF CONNECTOR EPDM ADHESIVE

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Black	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-42C **Lab Sample ID:** 621601601-0126
Sample Description: EXTERIOR ROOF CONNECTOR EPDM ADHESIVE

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/24/2016	Black	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-43A **Lab Sample ID:** 621601601-0127
Sample Description: EXTERIOR ROOF CONNECTOR FLASHING

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Black	0%	95%	5% Chrysotile	



EMSL Analytical, Inc.

161 John Roberts Road South Portland, ME 04106
 Phone/Fax: (207) 517-6921 / (207) 517-6922
<http://www.EMSL.com> / portlandlab@emsl.com

EMSL Order ID: 621601601
 Customer ID: ENVI54
 Customer PO: 20160749.A1E
 Project ID:

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116

Client Sample ID: 10-21-16-SMM-43B **Lab Sample ID:** 621601601-0128

Sample Description: EXTERIOR ROOF CONNECTOR FLASHING

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016					Positive Stop (Not Analyzed)

Client Sample ID: 10-21-16-SMM-43C **Lab Sample ID:** 621601601-0129

Sample Description: EXTERIOR ROOF CONNECTOR FLASHING

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016					Positive Stop (Not Analyzed)

Client Sample ID: 10-21-16-SMM-44A **Lab Sample ID:** 621601601-0130

Sample Description: EXTERIOR ROOF CONNECTOR FLASHING CAULK

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Gray	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	Gray	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-44B **Lab Sample ID:** 621601601-0131

Sample Description: EXTERIOR ROOF CONNECTOR FLASHING CAULK

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Gray	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-44C **Lab Sample ID:** 621601601-0132

Sample Description: EXTERIOR ROOF CONNECTOR FLASHING CAULK

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/24/2016	Gray	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-45A **Lab Sample ID:** 621601601-0133

Sample Description: EXTERIOR ROOF CONNECTOR LAP SEAM SEALANT

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Black	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	Black	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-45B **Lab Sample ID:** 621601601-0134

Sample Description: EXTERIOR ROOF CONNECTOR LAP SEAM SEALANT

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/21/2016	Black	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-45C **Lab Sample ID:** 621601601-0135

Sample Description: EXTERIOR ROOF CONNECTOR LAP SEAM SEALANT

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	10/24/2016	Black	0%	100%	None Detected	



EMSL Analytical, Inc.

161 John Roberts Road South Portland, ME 04106
 Phone/Fax: (207) 517-6921 / (207) 517-6922
<http://www.EMSL.com> / portlandlab@emsl.com

EMSL Order ID: 621601601
 Customer ID: ENVI54
 Customer PO: 20160749.A1E
 Project ID:

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116

Client Sample ID: 10-21-16-SMM-46A **Lab Sample ID:** 621601601-0136

Sample Description: EXTERIOR ROOF BUILDING WATER CUT OFF PIPE MASTIC/CAULK

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Gray	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	Gray	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-46B **Lab Sample ID:** 621601601-0137

Sample Description: EXTERIOR ROOF BUILDING WATER CUT OFF PIPE MASTIC/CAULK

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Gray	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-46C **Lab Sample ID:** 621601601-0138

Sample Description: EXTERIOR ROOF BUILDING WATER CUT OFF PIPE MASTIC/CAULK

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/24/2016	Gray	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-47A **Lab Sample ID:** 621601601-0139

Sample Description: EXTERIOR ROOF BUILDING LAP SEAM SEALANT CAULK

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Black	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	Black	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-47B **Lab Sample ID:** 621601601-0140

Sample Description: EXTERIOR ROOF BUILDING LAP SEAM SEALANT CAULK

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Black	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-47C **Lab Sample ID:** 621601601-0141

Sample Description: EXTERIOR ROOF BUILDING LAP SEAM SEALANT CAULK

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/24/2016	Black	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-48A **Lab Sample ID:** 621601601-0142

Sample Description: EXTERIOR ROOF BUILDING RESIDUAL TAR ON WOOD UNDER RUBBER FLASHING

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Brown/Black	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	Brown/Black	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-48B **Lab Sample ID:** 621601601-0143

Sample Description: EXTERIOR ROOF BUILDING RESIDUAL TAR ON WOOD UNDER RUBBER FLASHING

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Brown/Black	0%	100%	None Detected	



EMSL Analytical, Inc.

161 John Roberts Road South Portland, ME 04106
 Phone/Fax: (207) 517-6921 / (207) 517-6922
<http://www.EMSL.com> / portlandlab@emsl.com

EMSL Order ID: 621601601
 Customer ID: ENVI54
 Customer PO: 20160749.A1E
 Project ID:

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116

Client Sample ID: 10-21-16-SMM-48C **Lab Sample ID:** 621601601-0144

Sample Description: EXTERIOR ROOF BUILDING RESIDUAL TAR ON WOOD UNDER RUBBER FLASHING

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/24/2016	Black	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-49A **Lab Sample ID:** 621601601-0145

Sample Description: ROOM 104 INTERIOR WINDOW CAULKING

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Gray	0%	100%	None Detected	
TEM Grav. Reduction	10/25/2016	Gray	0.0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-49B **Lab Sample ID:** 621601601-0146

Sample Description: ROOM 104 INTERIOR WINDOW CAULKING

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/21/2016	Gray	0%	100%	None Detected	

Client Sample ID: 10-21-16-SMM-49C **Lab Sample ID:** 621601601-0147

Sample Description: ROOM 210 INTERIOR WINDOW CAULKING

TEST	Analyzed		Non-Asbestos		Asbestos	Comment
	Date	Color	Fibrous	Non-Fibrous		
PLM	10/24/2016	Gray	0%	100%	None Detected	

Analyst(s):

- Christina Walker PLM (49)
- Stephen Severn PLM (62)
- Zackary Carbee PLM (26)
- TEM Grav. Reduction (28)

Reviewed and approved by:

Christina Walker, Laboratory Manager
 or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. This test report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. EMSL bears no responsibility for sample collection activities or analytical method limitations. The laboratory is not responsible for the accuracy of results when requested to physically separate and analyze layered samples. PLM alone is not consistently reliable in detecting asbestos in floor coverings and similar NOBs

Samples analyzed by EMSL Analytical, Inc. South Portland, ME

Initial report from: 10/24/2016 13:43:53

Appendix D

Site Photographs



Connector Roof



Connector roof composition



Building addition roof



Building addition roof composition



Connector Exterior



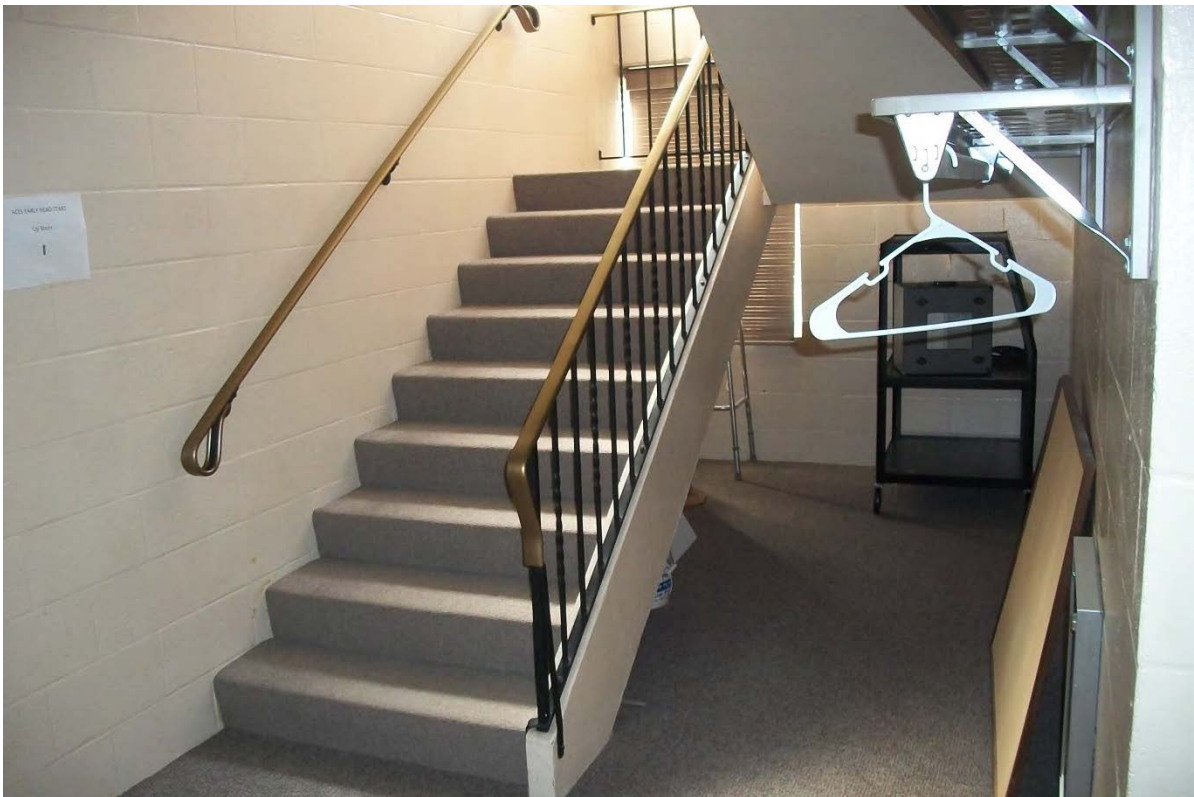
Representative exterior window caulking and glazing compounds



Building addition front



PCB light Ballast



Building addition Stairway



Building addition first floor



Representative interior window caulking and glazing compounds



Building addition second floor



Building addition representative bathroom

Appendix E

Lead Paint Determination Field Data Sheets



XRF LEAD SCREENING FIELD DATA SHEET

Inspector Name: Scott Mossy Inspector License #: _____
 Date: 10/14/16 XRF Model: 1138 Serial: _____
 Project Name: Aces Project Number: 20160749.A1E
 Address: 300 Washington St, Middletown Project PM: J Smith

XRF Calibration Check-RMD (0.7 to 1.3 mg/cm² inclusive)

	Hour	First Reading	Second Reading	Third Reading	Average
First Check	0800	1.1	1.2	1.0	1.1
Second Check	1036	1.1	1.1	1.1	1.1
Third Check	1439	1.1	1.1	1.1	1.1
Fourth Check					

Side	Surface/Component	Substrate	XRF Reading	Positive (v)	Comments/Notes
A	Brick siding	B	0.0		Tan
A	Brick siding	B	0.2		Brown trim
A	Window	M	-0.1		X sill Brick
A	Window lintel	M	0.6		white
A	Reef Facisic	Concrete Board	0.3		Brown
A	Window	M	-0.2		e connector
A	Handrail	M	-0.1		Tan
A	Handicap door system	M	0.0		gray
A	Door trim	M	0.0		Red (Skorwell)
A	Door	M	0.0		Red ↓
A	Down spout	M	-0.2		all white e concrete
A	Down spout	M	-0.1		No paint
B	Door trim	M	-0.2		Brown
B	Door	M	-0.0		Brown
B	Handrail	M	0.5		Tan
B	Handrail	M	0.4		Brown
	Foundation	Conc	0.6		Not painted
	Window	M	0.1		Not painted

* Substrate Type: Metal = M, Wood = W, Plaster = P, Sheetrock = S, Concrete = C, Brick = B
 N/A: Not Accessible; N/C: Not Coated; COV: Covered; VR - Vinyl Replacement



XRF LEAD SCREENING FIELD DATA SHEET (CONT.)

Project Name: ACES Project Number: 20160748-VIE

Address: 300 Washington St, Middletown Project PM: J. Smith

Side	Surface/Component	Substrate	XRF Reading	Positive (N)	Comments/Notes
B	Window lintel	M	0.4		Gray/white
B	Brick	B	0.0		Tan
B	Brick	B	0.1		Brown
C	Foundation	C	0.3		Dark pink
C	Brick	B	-0.1		Tan
C	Brick	B	-0.2		Brown
C	Window	M	0.0		not painted
C	Window lintel	M	0.0		Gray/white
C	Downspout	M	-0.2		not painted
C	Downspout ^{ground} leads	M	0.5		Whitel tan
C	Handrail ^{&} connector	M	0.7		tan
C	Door Frame	M	-0.2		not painted aluminum
C	Door lintel	M	-0.0		Gray/white
C	Rust fascia	ement Board	0.3		Brown
C	Mail Box	M	-0.1		Tan
	Mail Box post	M	0.4		Brown
	Calibrate		1.0		Calibrate
	↓	↓	1.1		↓
			1.0		
B	CONNECTOR DOOR TO BLDG	M	-0.0		DK BROWN
B	DOOR TRIM	M	-0.0		↓
B	DOOR FRAME	M	0.3		YELLOW
	CEILING TILE		0.3		
C	NORTH STAIRWELL WALL	CMU	-0.1		Beige
B	DOOR FRAME (DOOR TO DINING)	M	0.1		Beige
B	DOOR		-0.1		DK BROWN
A	BOTTOM OF STAIR	C	0.3		BEIGE

* Substrate Type: Metal = M, Wood = W, Plaster = P, Sheetrock = S, Concrete = C, Brick = B
N/A: Not Accessible; N/C: Not Coated; COV: Covered; VR - Vinyl Replacement



XRF LEAD SCREENING FIELD DATA SHEET (CONT.)

Project Name: ACES Project Number: 20160749.AIE

Address: 300 WASHINGTON ST MIDDLETOWN Project PM: JSMITH

Side	Surface/Component	Substrate	XRF Reading	Positive (✓)	Comments/Notes
A	GROUND N STAIR WINDOW SILL	B	-0.0		BEIGE
	N STAIR RAIL BALUSTER	M	0.3		BLACK
	N STAIR HAND RAIL	m	-0.0		GOLD
D	FELLOWSHIP HALL WALL	CMU	-0.1		WH
D	Door FRAME ^{sunday school off}	M	-0.0		WH
C	FELLOWSHIP WALL	CMU	0.0		WH
B	Nurse 109 WALL	CMU	-0.0		off YELLOW
D	Womens Rm window sill	B	0.5		WH
	Fellowship Dining ^{2x2}	ceiling tile	0.3		WH
A	107 Door FRAME	m	0.0		WH
A	107 WALL	CMU	0.2		WH
C	107 window sill	B	-0.0		WH
B	105 WALL	CMU	0.0		WH
B	105 window sill	B	-0.0		Wh
B	S Stair Door ^{inside}	M	-0.0		DK BR
B	S Stair Door FRAME ^{inside}	M	-0.0		Wh
D	104 sink cabinet door	W	0.2		Yellow
D	104 sink cabinet door	W	-0.0		BL
A?	103/104 sink cabinet base	W	0.3		Wh
B	103 sink cabinet door	W	0.1		Green
B	103 sink cabinet door	W	0.2		Red
B	104 Tree mural	CMU	0.1		BR
C	103/104 coat hook	W	-0.1		BL
C	103 coat hook	W	0.2		Red
A	102 window sill	B	0.1		Wh
A	102 window lintel	M	0.5		Wh
C	Womens Rm 4"x6"	ceramic	-0.0		cream

* Substrate Type: Metal = M, Wood = W, Plaster = P, Sheetrock = S, Concrete = C, Brick = B
N/A: Not Accessible; N/C: Not Coated; COV: Covered; VR - Vinyl Replacement



XRF LEAD SCREENING FIELD DATA SHEET (CONT.)

Project Name: ACES Project Number: 20160749, AIE

Address: 300 WASHINGTON ST MIDDLETOWN Project PM: JSmith

Side	Surface/Component	Substrate	XRF Reading	Positive (✓)	Comments/Notes
	Womens Rm 1"X1" floor tile	Ceramic	0.1		cream/tan/gy/br
D	Custodial wall	CMU	-0.2		Beige
C	109 elec Rm wall	CMU	0.0		yellow
	109 elec Rm Floor	C	-0.1		Grey
A	S Stair wall	CMU	0.2		Wh
A	S Stair door frame (exit)	M	0.3		Wh
A	S Stair door (exit)	M	0.1		DKBR
A	S Stair 2nd fl landing	C	-0.0		Wh
C	S Stair windowsill	B	-0.0		Wh
D	S Stair ballister railing	M	0.4		Blk
D	S Stair door to 2nd fl	M	0.1		DKBR
D	S Stair door frame	M	0.3		Wh
D	Rm 207 wall	CMU	-0.0		Wh
C	Rm 207 windowsill	B	-0.2		Wh
A	207 door frame (hall side)	M	0.3		Wh
C	208 wall	CMU	-0.2		Wh
A	209 wall	CMU	0.0		Pale yellow
A	209 door frame Room side	M	0.1		Pale yellow
D	210 wall	CMU	0.3		Wh
C	210 windowsill	B	-0.1		Wh
C	2nd fl womens - cove tile	Ceramic	0.1		cream
	2nd fl womens floor tile	Ceramic	-0.2		tan/cream/br
A	2nd fl womens wall	CMU	0.0		Wh
D	2nd fl custodial wall	CMU	0.0		Pale yellow or
	2nd fl Mens floor tile	Ceramic	0.1		grey, yellow 1"X1"
C	2nd fl Storage	CMU	0.1		pale yellow

* Substrate Type: Metal = M, Wood = W, Plaster = P, Sheetrock = S, Concrete = C, Brick = B
N/A: Not Accessible; N/C: Not Coated; COV: Covered; VR - Vinyl Replacement

Appendix F

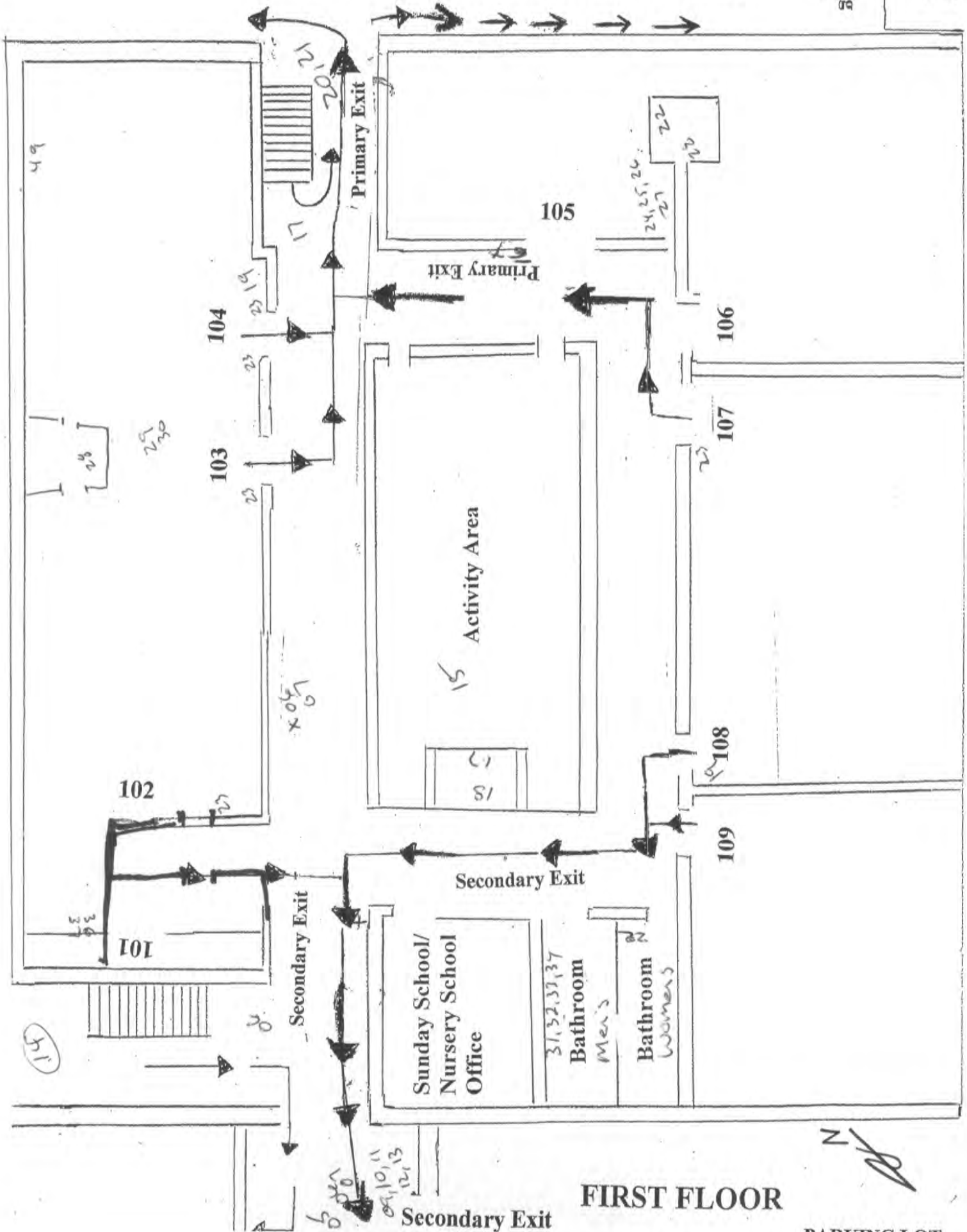
Site Floor Plans

Luther House

Meeting Place

PARKING LOT

Primary Exit



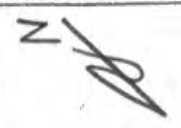
FIRST FLOOR

Secondary Exit

Secondary Exit

Primary Exit

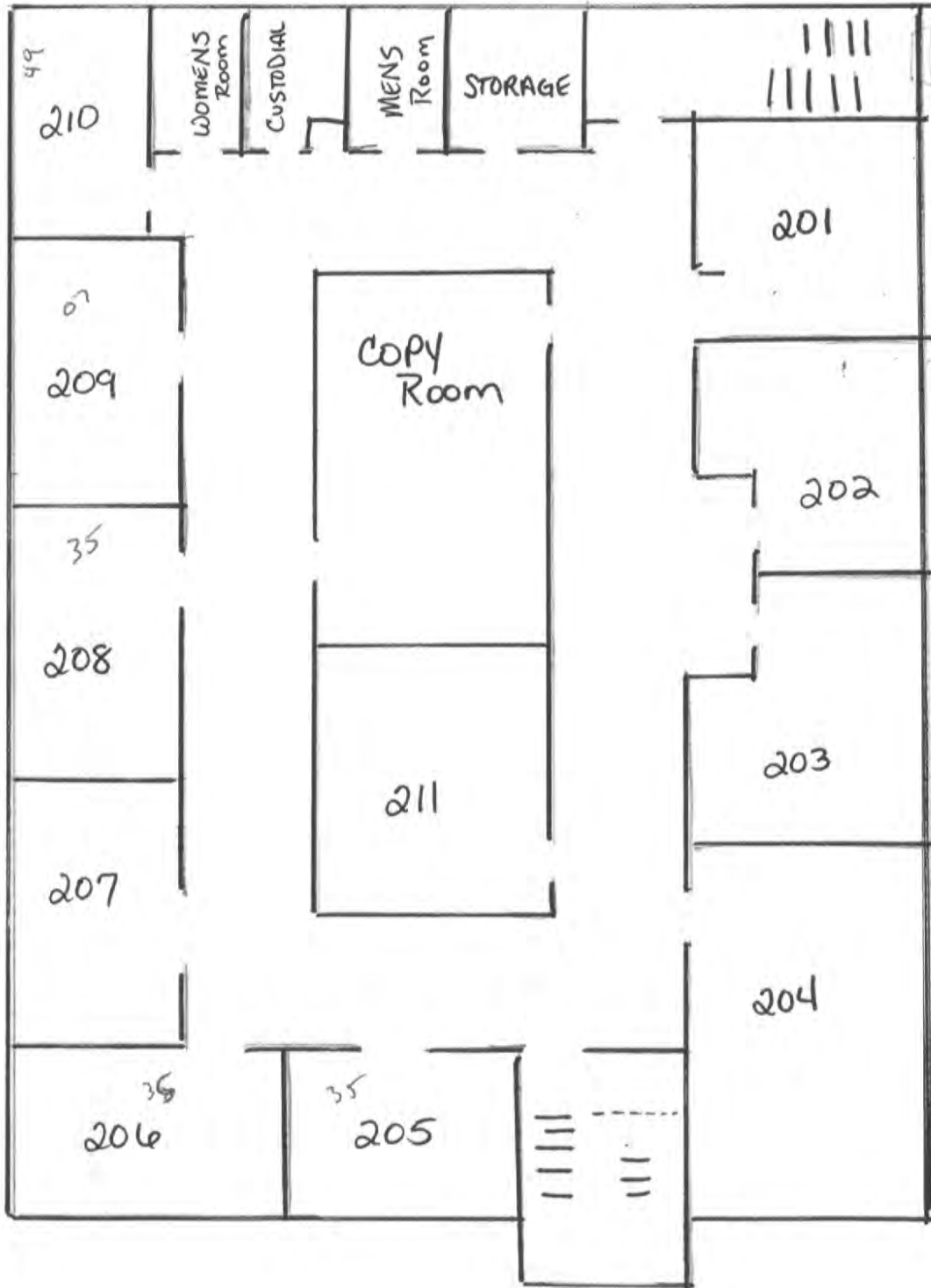
Primary Exit



ACES - 2nd FLOOR

Sheet No
of

not to scale





Google Earth



10/14/16



ROOF SAMPLING LOCATIONS

- ① CONNECTOR - ROOF FIELD
- ② CONNECTOR - FLASHING
- ③ CONNECTOR - FLASHING CAULK (@CHURCH)
- ④ BUILDING - ROOF FIELD
- ⑤ BUILDING - FLASHING
- ⑥ BUILDING - WATER CUTOFF PIPE
- * OTHER WATER CUTOFF PIPE LOCATIONS

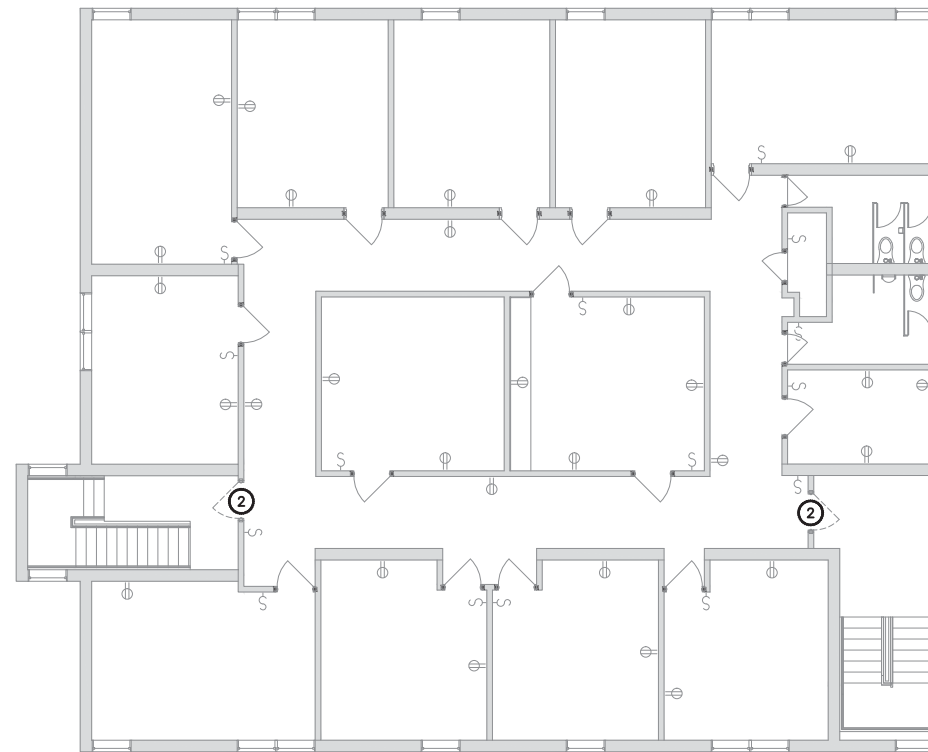
ATTACHMENT B
DRAWING HM-001

HAZARDOUS MATERIALS ABATEMENT NOTES

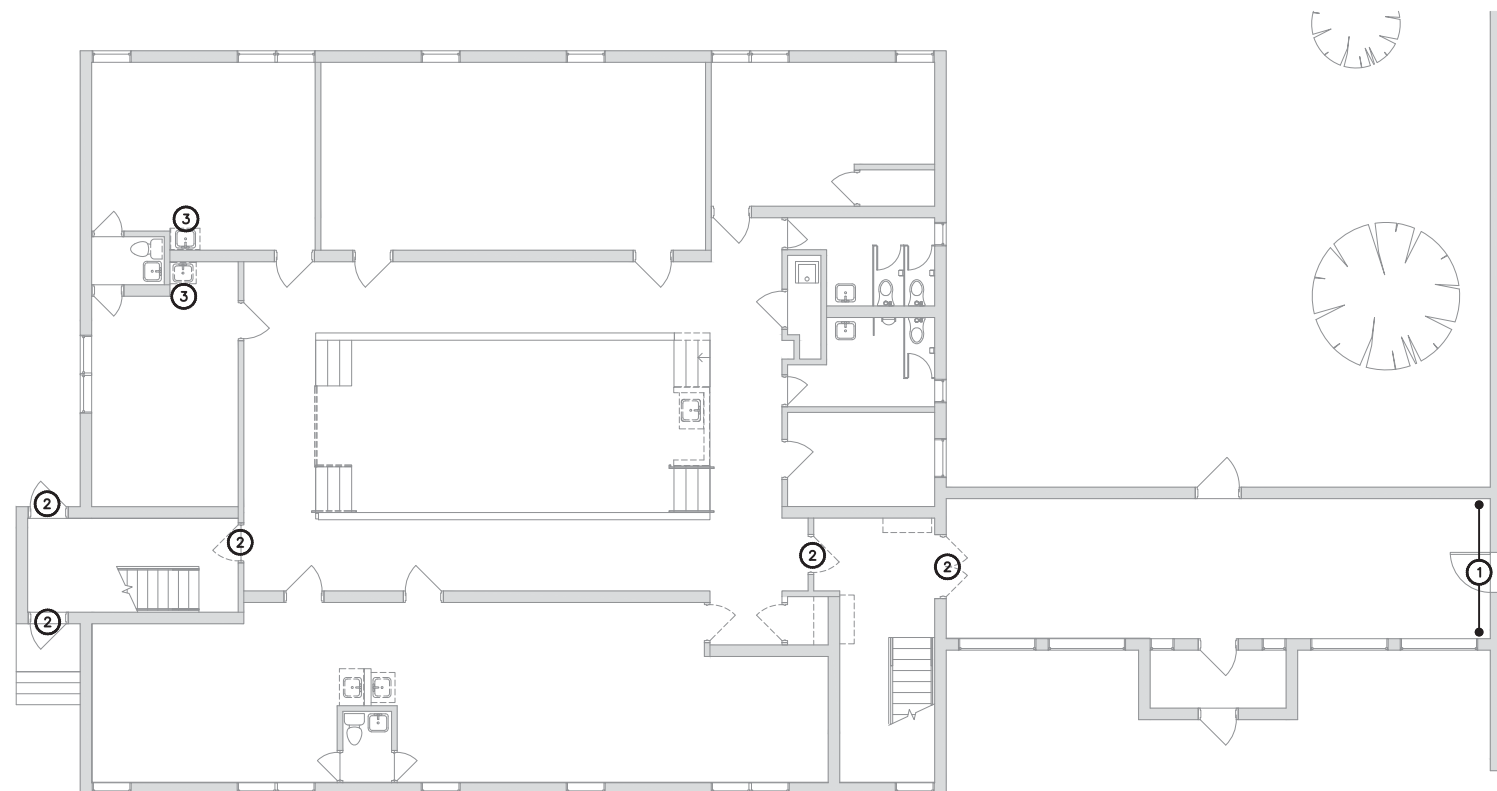
- ① THE HAZARDOUS MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF BROWN CAULK, BACKER ROD AND ANY NON MASONRY MATERIAL ASSOCIATED WITH BRICK CONNECTION JOINT, DOWN TO A CLEAN SUBSTRATE, AS ACM.
- ② THE HAZARDOUS MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE HINGES FROM THE DOOR JAMB AND DISPOSE OF INTACT DOOR SLAB AS ACM.
- ③ THE HAZARDOUS MATERIALS ABATEMENT CONTRACTOR SHALL REMOVE AND DISPOSE OF ALL CAULKING AND ASSOCIATED ADHESIVES ASSOCIATED WITH LAMINATE COUNTERTOP / BACKSPLASH AS ACM.

GENERAL NOTES

1. THIS PROJECT MAY REQUIRE MULTIPLE MOBILIZATIONS. WORK IS TO BE COORDINATED WITH BUILDING OWNER AND OTHER TRADES.
2. THE HAZARDOUS MATERIALS ABATEMENT CONTRACTOR SHALL INCLUDE SELECTIVE DEMOLITION AND ABATEMENT OF INACCESSIBLE MATERIALS IF REQUIRED BY RENOVATION ACTIVITIES.
3. THE HAZARDOUS MATERIALS ABATEMENT CONTRACTOR IS RESPONSIBLE FOR PROTECTING EXISTING CONSTRUCTION AND FOR TEMPORARY PROTECTION.
4. THE HAZARDOUS MATERIALS ABATEMENT CONTRACTOR IS RESPONSIBLE FOR THE VERIFICATION OF ALL EXISTING CONDITIONS AND QUANTITIES AND FOR NOTIFYING THE CONSULTANT OF ANY DISCREPANCIES PRIOR TO FINALIZING BID.
5. A VAPOR BARRIER BETWEEN INTERIOR AND EXTERIOR MASONRY WALLS IS ASSUMED TO BE PRESENT AND ASBESTOS CONTAINING. ABATEMENT CONTRACTOR TO COORDINATE WITH THE GENERAL CONTRACTOR TO CONDUCT ALL DRILLING AND CORING THROUGH THE EXTERIOR MASONRY WALLS AS IDENTIFIED IN THE MECHANICAL DRAWINGS OR AS OTHERWISE REQUIRED.



② SECOND FLOOR HAZARDOUS MATERIAL ABATEMENT PLAN
SCALE: 1/8" = 1'-0"



① FIRST FLOOR HAZARDOUS MATERIAL ABATEMENT PLAN
SCALE: 1/8" = 1'-0"

PATRIQUIN
ARCHITECTS

20 GRAND AVENUE
NEW HAVEN, CT 06513

ACES - MIDDLETOWN

300 WASHINGTON STREET
MIDDLETOWN, CT

OWNER

aces 350 State Street
North Haven, CT 06473
www.aces.org

ARCHITECT

PATRIQUIN ARCHITECTS
20 Grand Avenue, New Haven, CT 06513
203.535.1688
firstname@patriquinarchitects.com

MEPPF ENGINEER

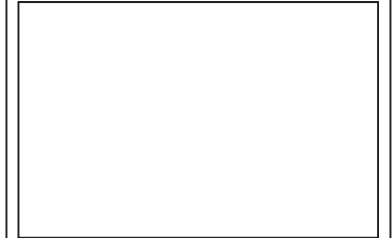
ACORN CONSULTING ENGINEERS, INC.
244 FARMS VILLAGE ROAD, WEST SIMSBURY CT 06092
860.651.1949
www.acornengineers.com

DRAWING RELEASE DATE OF ISSUE
ISSUED FOR BID JULY 28, 2017

REVISIONS

No.	Description	Date

KEY PLAN



SEAL

THIS COMPUTER FILE/DRAWING IS FOR INFORMATIONAL PURPOSES ONLY AND IS NOT INTENDED FOR CONSTRUCTION. DO NOT START CONSTRUCTION WITHOUT A SEALED SET OF CONSTRUCTION DOCUMENTS FROM THE ARCHITECT.

HAZARDOUS
MATERIAL
ABATEMENT PLAN

HM-001

Scale 1/8" = 1'-0"
Drawn by Author | Checked by Checker

**Minimum Rates and Classifications
for Building Construction**

ID# : B 23872

**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: Middletown

State#:

FAP#:

Project: ACES Renovation To 300 Washington Street

CLASSIFICATION	Hourly Rate	Benefits
1a) Asbestos Worker/Insulator (Includes application of insulating materials, protective coverings, coatings, & finishes to all types of mechanical systems; application of firestopping material for wall openings & penetrations in walls, floors, ceilings	38.25	27.96
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	39.00	28.76

As of: **Tuesday, July 25, 2017**

Project: ACES Renovation To 300 Washington Street

2) Boilermaker	38.34	26.01
----------------	-------	-------

3a) Bricklayer, Cement Mason, Concrete Finisher (including caulking), Stone Masons	33.48	30.61 + a
---	-------	-----------

3b) Tile Setter	34.90	24.69
-----------------	-------	-------

3c) Terrazzo Mechanics and Marble Setters	31.69	22.35
---	-------	-------

3d) Tile, Marble & Terrazzo Finishers	26.70	21.02
---------------------------------------	-------	-------

3e) Plasterer	33.48	30.61
---------------	-------	-------

As of: Tuesday, July 25, 2017

Project: ACES Renovation To 300 Washington Street

-----LABORERS-----

4) Group 1: Laborers (common or general), acetylene burners, carpenter tenders, concrete specialists, wrecking laborers, fire watchers.	29.25	19.50
---	-------	-------

4a) Group 2: Mortar mixers, plaster tender, power buggy operators, powdermen, fireproofers/mixer/nozzleman (Person running mixer and spraying fireproof only).	29.50	19.50
--	-------	-------

4b) Group 3: Jackhammer operators/pavement breaker, mason tender (brick), mason tender (cement/concrete), forklift operators and forklift operators (masonry).	29.75	19.50
--	-------	-------

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.	29.75	19.50
---	-------	-------

4d) Group 5: Air track operator, sand blaster and hydraulic drills.	29.75	19.50
---	-------	-------

As of: Tuesday, July 25, 2017

Project: ACES Renovation To 300 Washington Street

4e) Group 6: Blasters, nuclear and toxic waste removal.	31.00	19.50
---	-------	-------

4f) Group 7: Asbestos/lead removal and encapsulation (except it's removal from mechanical systems which are not to be scrapped).	30.25	19.50
--	-------	-------

4g) Group 8: Bottom men on open air caisson, cylindrical work and boring crew.	28.38	19.50
--	-------	-------

4h) Group 9: Top men on open air caisson, cylindrical work and boring crew.	27.86	19.50
---	-------	-------

4i) Group 10: Traffic Control Signalman	16.00	19.50
---	-------	-------

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.	32.60	25.34
---	-------	-------

As of: Tuesday, July 25, 2017

Project: ACES Renovation To 300 Washington Street

5a) Millwrights	33.14	25.74
-----------------	-------	-------

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)	39.15	25.17+3% of gross wage
--	-------	------------------------

7a) Elevator Mechanic (Trade License required: R-1,2,5,6)	50.14	31.585+a+b
---	-------	------------

-----LINE CONSTRUCTION-----

Groundman	25.93	6.5% + 8.53
-----------	-------	-------------

Linemen/Cable Splicer	47.14	6.5% + 20.98
-----------------------	-------	--------------

As of: Tuesday, July 25, 2017

Project: ACES Renovation To 300 Washington Street

8) Glazier (Trade License required: FG-1,2)	35.58	20.15 + a
---	-------	-----------

9) Ironworker, Ornamental, Reinforcing, Structural, and Precast Concrete Erection	35.47	33.39 + a
---	-------	-----------

----OPERATORS----

Group 1: Crane handling or erecting structural steel or stone, hoisting engineer 2 drums or over, front end loader (7 cubic yards or over), work boat 26 ft. and over and Tunnel Boring Machines. (Trade License Required)	39.30	24.05 + a
--	-------	-----------

Group 2: Cranes (100 ton rate capacity and over); Excavator over 2 cubic yards; Piledriver (\$3.00 premium when operator controls hammer); Bauer Drill/Caisson. (Trade License Required)	38.98	24.05 + a
--	-------	-----------

Group 3: Excavator; Backhoe/Excavator under 2 cubic yards; Cranes (under 100 ton rated capacity), Grader/Blade; 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 Fine Grade. (slopes, shaping, laser or GPS, etc.). (Trade License Required)	38.24	24.05 + a
--	-------	-----------

As of: Tuesday, July 25, 2017

Project: ACES Renovation To 300 Washington Street

Group 4: Trenching Machines; Lighter Derrick; Concrete Finishing Machine; CMI Machine or Similar; Koehring Loader (Skooper).	37.85	24.05 + a
--	-------	-----------

Group 5: Specialty Railroad Equipment; Asphalt Paver; 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" Mandrell)	37.26	24.05 + a
--	-------	-----------

Group 5 continued: Side Boom; Combination Hoe and Loader; Directional Driller; Pile Testing Machine.	37.26	24.05 + a
--	-------	-----------

Group 6: Front End Loader (3 up to 7 cubic yards); Bulldozer (rough grade dozer).	36.95	24.05 + 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 Mandrell).	36.61	24.05 + a
--	-------	-----------

Group 8: Mechanic, grease truck operator, hydroblaster; barrier mover; power stone spreader; welding; work boat under 26 ft.; transfer machine.	36.21	24.05 + a
---	-------	-----------

As of: Tuesday, July 25, 2017

Project: ACES Renovation To 300 Washington Street

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).	35.78	24.05 + a
--	-------	-----------

Group 10: Vibratory hammer; ice machine; diesel and air, hammer, etc.	33.74	24.05 + a
---	-------	-----------

Group 11: Conveyor, earth roller, power pavement breaker (whiphammer), robot demolition equipment.	33.74	24.05 + a
--	-------	-----------

Group 12: Wellpoint operator.	33.68	24.05 + a
-------------------------------	-------	-----------

Group 13: Compressor battery operator.	33.10	24.05 + a
--	-------	-----------

Group 14: Elevator operator; tow motor operator (solid tire no rough terrain).	31.96	24.05 + a
--	-------	-----------

As of: Tuesday, July 25, 2017

Project: ACES Renovation To 300 Washington Street

Group 15: Generator Operator; Compressor Operator; Pump Operator; Welding Machine Operator; Heater Operator.	31.55	24.05 + a
--	-------	-----------

Group 16: Maintenance Engineer/Oiler.	30.90	24.05 + a
---------------------------------------	-------	-----------

Group 17: Portable asphalt plant operator; portable crusher plant operator; portable concrete plant operator.	35.21	24.05 + a
---	-------	-----------

Group 18: Power safety boat; vacuum truck; zim mixer; sweeper; (Minimum for any job requiring a CDL license).	32.79	24.05 + a
---	-------	-----------

-----PAINTERS (Including Drywall Finishing)-----

10a) Brush and Roller	32.02	20.15
-----------------------	-------	-------

As of: Tuesday, July 25, 2017

Project: ACES Renovation To 300 Washington Street

10b) Taping Only/Drywall Finishing	32.77	20.15
------------------------------------	-------	-------

10c) Paperhanger and Red Label	32.52	20.15
--------------------------------	-------	-------

10e) Blast and Spray	35.02	20.15
----------------------	-------	-------

11) Plumber (excluding HVAC pipe installation) (Trade License required: P-1,2,6,7,8,9 J-1,2,3,4 SP-1,2)	41.62	30.36
--	-------	-------

12) Well Digger, Pile Testing Machine	33.01	19.40 + a
---------------------------------------	-------	-----------

13) Roofer (composition)	34.92	19.28
--------------------------	-------	-------

As of: Tuesday, July 25, 2017

Project: ACES Renovation To 300 Washington Street

14) Roofer (slate & tile)	35.42	19.28
---------------------------	-------	-------

15) Sheetmetal Worker (Trade License required for HVAC and Ductwork: SM-1,SM-2,SM-3,SM-4,SM-5,SM-6)	37.18	34.29
--	-------	-------

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)	41.62	30.36
---	-------	-------

-----TRUCK DRIVERS-----

17a) 2 Axle	29.13	22.32 + a
-------------	-------	-----------

17b) 3 Axle, 2 Axle Ready Mix	29.23	22.32 + a
-------------------------------	-------	-----------

As of: Tuesday, July 25, 2017

Project: ACES Renovation To 300 Washington Street

17c) 3 Axle Ready Mix	29.28	22.32 + a
-----------------------	-------	-----------

17d) 4 Axle, Heavy Duty Trailer up to 40 tons	29.33	22.32 + a
---	-------	-----------

17e) 4 Axle Ready Mix	29.38	22.32 + a
-----------------------	-------	-----------

17f) Heavy Duty Trailer (40 Tons and Over)	29.58	22.32 + a
--	-------	-----------

17g) Specialized Earth Moving Equipment (Other Than Conventional Type on-the-Road Trucks and Semi-Trailers, Including Euclids)	29.38	22.32 + a
--	-------	-----------

18) Sprinkler Fitter (Trade License required: F-1,2,3,4)	43.92	15.84 + a
--	-------	-----------

As of: Tuesday, July 25, 2017

Project: ACES Renovation To 300 Washington Street

19) Theatrical Stage Journeyman	25.76	7.34
---------------------------------	-------	------

Project: ACES Renovation To 300 Washington Street

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*

ALL Cranes: When crane operator is operating equipment that requires a fully licensed crane operator to operate he receives an extra \$4.00 premium in addition to the hourly wage rate and benefit contributions:

1) Crane handling or erecting structural steel or stone; hoisting engineer (2 drums or over)

2) Cranes (100 ton rate capacity and over) Bauer Drill/Caisson

3) Cranes (under 100 ton rated capacity)

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.

As of: Tuesday, July 25, 2017

Project: ACES Renovation To 300 Washington Street

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: Tuesday, July 25, 2017

Exhibit E – Sample Digital Model and CAD Files License Agreement

Licensors: **Patriquin Architects, P.C (“Patriquin Architects”)**

Licensee: **Contractor, Subcontractor, or CM Name (“the Licensee”)**

Project: **ACES Interior Renovations & Improvements to 300 Washington Street**
(“the Project”)

Location: **300 Washington Street, Middletown CT**

Owner: **ACES**

Patriquin Architects grants the Licensee a Limited License (License) for the use of the following:
(Select one or both of the following:)

1. 2D Computer Aided Drafting Files (CAD files), as prepared by Patriquin Architects and its consultants, representing the 2D signed and sealed Contract Documents, including drawing revisions, addenda, modifications, and supplemental drawings prepared for the project subsequent to the issuance of the Contract Documents.
2. 3D Digital Model Files (the Model) provided by Patriquin Architects from Revit or Navisworks software programs.

This License shall allow the conditional use of the Model and CAD files provided by Patriquin Architects and its consultants during the Construction Phase of this project. Patriquin Architects and its consultants are providing these files for the convenience of the Licensee and for reference only, to enhance your general understanding of the design intent for the project and for use in preparing shop drawings, coordination drawings, and other submittals. Use of the digital model and CAD files is subject to the terms and conditions noted herein and in the Contract Documents.

The Digital Files were prepared on the following software:

1. CAD Files: AutoCAD, version 2015
2. Model: Revit, version 2017

The parties agree to the following terms and conditions:

1. Patriquin Architects makes no representation as to the accuracy or completeness of the Model and CAD files as they relate to the Contract Documents. The Licensee accepts that elements of the Model and CAD files may conflict with the Contract Documents. In the event that a conflict arises between the paper copies Contract Documents and the Model or CAD files, the paper copy Contract Documents shall govern.

Digital Model and CAD Files License Agreement

Page 2

2. The information in the Model and CAD file(s) may be incomplete, inaccurate, corrupted, or defective due to many causes including, but not limited to, drafting errors, unforeseen alterations, program translation, or interoperability conflicts.
3. The Model and CAD files are not an element of the Contract Documents.
4. The Model and CAD files are among a number of tools that the Patriquin Architects and its consultants used to prepare the Contract Documents. The Contract Documents, in some cases, contain carefully extracted and enhanced elements of this file(s). However, the Licensee should never assume that all elements of the Model and CAD files are accurate or identical to the Contract Documents.
5. The Licensee's use of the Model and CAD files for any use is at the Licensee's sole risk.
6. Any other use of the Model and CAD files, such as for technical analysis, clash detection, quantity assessment, dimensional interpretation, shop fabrication drawing, or any other direct or indirect analysis, is strictly prohibited.
7. The Licensee may transfer copies of the CAD files in electronic or paper form to its Subcontractors or material suppliers having direct involvement in the Project without any further license or waiver. Patriquin Architects and its consultants make no representation as to the compatibility of the CAD files with any hardware or software used by the Subcontractors and material suppliers.
8. The Licensee may transfer the Model provided by Patriquin Architects to its Subcontractors or material suppliers having direct involvement in the Project only if the aforesaid Subcontractors and material suppliers execute and transmit to Patriquin Architects a copy of this License. Patriquin Architects and its consultants make no representation as to the compatibility of the Model with any hardware or software used by the Subcontractors and material suppliers.
9. As a condition to transferring the Model, the Licensee shall, prior to any such transfer, advise the Subcontractors and material suppliers receiving the Model of the appropriate and licensed use(s) of the Model.
10. The Model shall not be uploaded, posted, or transferred to any website, information exchange software application, or hosting website without the prior consent of Patriquin Architects.
11. Any transfer of the Model and CAD files to parties other than the Licensee's Subcontractors and material suppliers is strictly forbidden.
12. The Licensee agrees to defend, indemnify, and hold Patriquin Architects and its consultants harmless from any claims, suits, or losses (including reasonable attorney's fees and all legal expenses) arising out of or in any way related to the Licensee's use of the Model and CAD files.

Digital Model and CAD Files License Agreement

Page 3

13. This License shall terminate upon Final Completion of the Project as defined in the Contract Documents.

Agreed to by the Licensee:

Signature: _____ Date: _____

Printed Name and Title: _____

Company: _____

(Complete the following when the Model is transferred to Subcontractors and material suppliers)

The Subcontractor or Material Supplier signing below acknowledges and accepts the terms and conditions of this License with regard to the use of Model as a condition for receiving the Model for the Project. The Subcontractor or Material Supplier also acknowledges that it has been advised as to the appropriate uses for the Model.

Agreed to by:

Signature: _____ Date: _____

Printed Name and Title: _____

Company: _____