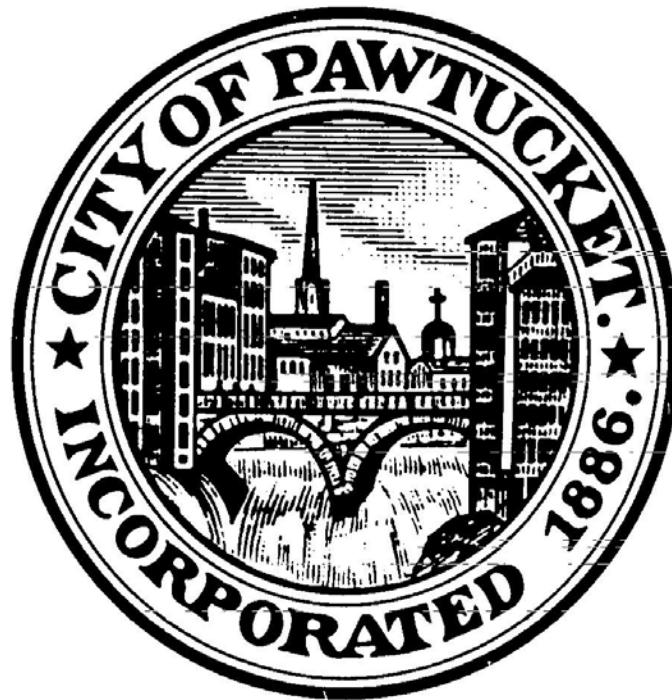


# CITY OF PAWTUCKET

## REQUEST FOR PROPOSALS



**Bid #22-014 Pawtucket City Hall Fire  
Department Rescue Room & Kitchen Interior  
Renovations**

May 24, 2022

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- Appendix E Site Plans Issued for Bid
- Appendix F Technical Specifications Issued for Bid

## 1.0 - Bid/Solicitation Information

### **Schedule**

Pre-Bid/Proposal Conference:  No  Yes

June 9, 2022 @ 11:00 AM

\*\*\*\*\* **Mandatory** \*\*\*\*\*

Location:

Fire Department - 137 Roosevelt Avenue  
Pawtucket, RI 02860

Requests for Further Information:

June 15, 2022 @ 4:30 PM

Requests for information or clarification must be made electronically to the attention of:

Joe Morais, Engineering Senior Project Leader

E-mail: [jmorais@pawtucketri.com](mailto:jmorais@pawtucketri.com)

Please reference the RFP / LOI number on all correspondence. Answers to questions received, if any, will be posted on the internet as an addendum to this bid solicitation.

RFP Submission Deadline:

June 23, 2022 at 12:00 PM

**Late submittals will not be considered.**

Proposals (pages 15 - 22 only) must be mailed or hand-delivered in a sealed envelope **marked with the RFP/Bid # and Project Name** to:

Pawtucket City Hall - Purchasing Office  
137 Roosevelt Avenue  
Pawtucket, RI 02860

### **Bonds/Surety Required**

Bid Bond:  No  Yes

Bidder is required to provide a bid surety in the form of a bid bond or certified check payable to the City of Pawtucket in an amount not less than five percent (5%) of the bid price.

Fidelity Bond:  No  Yes

Performance and Payment Bond:  No  Yes

(Submit upon award of contract)

Bidder is required to provide a performance and payment bond as outlined in the City's General Terms & Conditions of Purchase (Appendix B of this RFP) in an amount not less than one hundred percent (100%) of the bid price.

The successful bidder will be required to furnish all insurance documentation as outlined in the attached Purchasing Rules & Regulations and General Terms & Conditions of Purchase.

### **Miscellaneous**

The bid process and resulting contract are subject to the Rules and Regulations and General Terms and Conditions of Purchase. Submission of a bid in response to this solicitation is acknowledgement and acceptance of these Rules and Regulations and General Terms and Conditions of Purchase.

The City of Pawtucket reserves the right to award on the basis of cost alone, accept or reject any or all bids, and to act in its best interest including, but not limited to, directly negotiating with any vendor who submits a proposal in response to this RFP and to award a contract based upon the results of those negotiations alone. Proposals found to be technically or substantially non-responsive at any point in the evaluation process will be rejected and not considered further. The City of Pawtucket may, at its sole option, elect to require presentations(s) by bidders clearly in consideration for award.

## 2.0 - Instructions and Notifications to Bidders

- It is the vendor's responsibility to examine all specifications and site conditions thoroughly, and comply fully with specifications and all attached terms and conditions. Vendors must comply with all Federal, State, and City laws, ordinances and regulations, and meet any and all registration requirements where required for contractors as set forth by the State of Rhode Island. Failure to make a complete submission as described herein may result in a rejection of the proposal.
- All costs associated with developing or submitting a proposal in response to this Request, or to provide oral or written clarification of its content shall be borne by the bidder. The City of Pawtucket assumes no responsibility for these costs.
- A submittal may be withdrawn by written request to the Purchasing Agent by the proposer prior to the stated RFP deadline.
- Prior to the proposal deadline established for this RFP, changes may be made to a proposal already received by the City if that vendor makes a request to the Purchasing Agent, in writing, to do so. No changes to a proposal shall be made after the RFP deadline.
- Proposals are considered to be irrevocable for a period of not less than ninety (90) days following the opening date, and may not be withdrawn, except with the express written permission of the Purchasing Agent. Should any vendor object to this condition, the vendor must provide objection through a question and/or complaint to the Purchasing Agent prior to the proposal deadline.
- All pricing submitted will be considered to be firm and fixed unless otherwise indicated herein.
- The vendor has full responsibility to ensure that the proposal arrives at the Purchasing Division Office prior to the deadline set out herein. The City assumes no responsibility for delays caused by the U.S. Postal Service or any other delivery service. Postmarking by the due date will not substitute for actual receipt of response by the due date. Proposals arriving after the deadline may be returned, unopened, to the vendor, or may simply be declared non-responsive and not subject to evaluation, at the sole discretion of the Purchasing Agent. **For the purposes of this requirement, the official time and date shall be that of the time clock in the City of Pawtucket's Purchasing Office.**
- At the time and place fixed for the opening of Bids, the Owner will cause to be opened and publicly read aloud every Bid received within the time set for receiving Bids, irrespective of any irregularities therein. Bidders and other persons properly interested may be present, in person or by representative.
- It is intended that an award pursuant to this Request will be made to a prime contractor, who will assume responsibility for all aspects of the work. Joint venture and cooperative proposals will not be considered, but subcontracts are permitted, provided that their use is clearly indicated in the bidder's proposal, and the subcontractor(s) proposed to be used are identified in the proposal.
- Bidders are advised that all materials submitted to the City of Pawtucket for consideration in response to this Request for Proposals shall be considered to be public records as defined in Title 38 Chapter 2 of the Rhode Island General Laws,

without exception, and may be released for inspection immediately upon request once an award has been made.

- Vendors are responsible for errors and omissions in their proposals. No such error or omission shall diminish the vendor's obligations to the City.
- The City reserves the right to reject any or all proposals, or portions thereof, at any time, with no penalty. The City also has the right to waive immaterial defects and minor irregularities in any submitted proposal at its sole discretion. All material submitted in response to this RFP shall become the property of the City of Pawtucket upon delivery to the Purchasing Agent.
- Bids will be opened publicly at a regularly scheduled purchasing board meeting, the date of which is the same as the RFP submission deadline provided in Section 1.0.
- Interpretations or Addenda: No oral interpretation will be made to any Bidder as to the meaning of the Contract Documents or any part thereof. Every request for such an interpretation shall be made in writing to the City of Pawtucket (hereinafter called the "Owner"). Any inquiry received seven or more days prior to the date fixed for opening of Bids will be given consideration. Every interpretation made to a Bidder will be in the form of an Addendum to the Contract Documents, and when issued, will be on file in the office of the Owner at least five days before Bids are opened. In addition, all Addenda will be mailed to each person holding Contract Documents, but it shall be the Bidder's responsibility to make inquiry as to the Addenda issued. All such Addenda shall become part of the Contract and all Bidders shall be bound by such Addenda, whether or not received by the Bidders.
- Each Bidder shall, upon request of the Owner, submit a detailed financial statement on a form furnish by the Owner for that purpose. The Owner shall have the right to take such steps as it deems necessary to determine the ability of the Bidder to perform his obligations under the Contract and the Bidder shall furnish the Owner all such information and data for this purpose as it may request. The right is reserved to reject any Bid where an investigation of the available evidence or information does not satisfy the Owner that the Bidder is qualified to carry out properly the terms of the Contract.

## **3.0 - Overview**

### **3.1 Project Overview**

The City of Pawtucket Department of Public Works (“DPW” or “the City”) seeks proposals from qualified contractors (“Bidders” or “Contractors”) to renovate the existing kitchen and former dispatch room at the Fire Department located at Pawtucket City Hall (“the Project”) located at 137 Roosevelt Avenue, Pawtucket, RI 02860. Proposed renovations generally consist of installing new flooring and wall partitions, wall paneling, furnishings, ceilings, lighting, plumbing and mechanical equipment. Project must begin promptly following contract award (estimated July 9, 2022).

### **3.2 Project Background**

The Project has been commissioned per the recommendations of the administration of the City of Pawtucket in order to improve the facilities conditions.

## **4.0 - Scope of Work**

### **4.1 Location**

The location of the proposed construction activity (“the Project”) is shown on the Site Plans Issued for Bid included in this RFP as Appendix D. In general terms, the location of the Project can be described as follows:

- Pawtucket Fire Department located at Pawtucket City Hall – 137 Roosevelt Avenue, Pawtucket, RI 02860
- Portions of the following properties:
  - Mblu: 43/ /0485/ /
  -

### **4.2 General Requirements**

#### **4.2.1 Project Schedule**

The Contractor shall achieve substantial completion no later than October 3, 2022.

#### **4.2.2 Hours of Work**

The Contractor shall be allowed to work on-Site from 7:30 AM to 4:30 PM, seven days a week. Work during extended hours shall be allowed only with prior permission by the City.

#### **4.2.4 Prevailing Wage Requirements**

Bidders are advised that payment of the local prevailing wage, as established by the Rhode Island Department of Labor and Training, is a requirement of this project, as outlined in Appendix B. A copy of the current prevailing wage decision is included in this document as Appendix C. Bidders are advised that the City will not amend this document prior to the bid due date for the purpose of notifying bidders of a superseding wage decision(s). Bidders are expected to account for the prevailing wage rates applicable to this project in the formulation of their bid.

#### **4.2.5 Payment Requisitions**

The Contractor shall prepare draft requisitions for payment for the Project Engineer's review and approval and revise the requisitions as necessary prior to submission to the Owner. Payment requisitions shall be prepared using AIA Standard Forms G702 and G703.

The Owner reserves the right to withhold 5% of each progressive request for payment as retainage. The Owner shall release retainage payments per the terms outlined in Section 12.0 of this RFP.

#### **4.3 Scope Detail**

The scope of work is defined comprehensively in the Site Plans and Specifications issued for bid, which are incorporated into this RFP as Appendices D and E, respectively.

In general terms, the Project includes, but is not limited to, the following construction activities:

1. Mobilization and demobilization to and from the Site.
2. Site preparation including demolition and replacement of existing mechanical, plumbing and electrical components.
3. Removal of kitchen casework and finishes
4. Demolition of existing wall partitions.
5. Installation of new wall partitions and finishes
6. Painting new wall partitions
7. Installation of new suspended ceiling grid systems
8. Installation of a new water closet.
9. Removal and replacement of door frames and doors.
10. Installation of window treatments.
11. Removal of window glazing and installation of new insulated metal panels
12. Installation of new kitchen casework and appliances
13. Installation of wall panels.



## **5.0 - Insurance**

The vendor shall maintain and keep in force such comprehensive general liability insurance as shall protect them from claims which may arise from operations under any contract entered into with the City of Pawtucket, whether such operations be by themselves or by anyone directly or indirectly employed by them.

The amounts of insurance shall be not less than \$1,000,000.00 combined single limit for any one occurrence covering both bodily injury and property damage, including accidental death.

The City of Pawtucket shall be named as additional insured on the vendor's General Liability Policy.

The vendor shall maintain and keep in force such Workers' compensation insurance limits as required by the statutes of the State of Rhode Island, and Employer's Liability with limits no less than \$500,000.

## **6.0 - Acknowledgement of Risk & Hold Harmless Agreement**

In addition to the indemnity provisions in the City of Pawtucket's Terms and Conditions of Purchase and to the fullest extent permitted by law, the selected vendor, its officers, agents, servants, employees, parents, subsidiaries, partners, officers, directors, attorneys, insurers, and/or affiliates (Releasors) agree to release, waive, discharge and covenant not to sue the City of Pawtucket, its officers, agents, servants or employees (Releasees) from any and all liability, claims, cross-claims, rights in law or in equity, agreements, promises demands, actions and causes of action whatsoever arising out of or related to any loss, damage, expenses (including without limitation, all legal fees, expenses, interest and penalties) or injury (including death), of any type, kind or nature whatsoever, whether based in contract, tort, warranty, or other legal, statutory, or equitable theory of recovery, which relate to or arise out of the Releasors use of or presence in and/or on City of Pawtucket property. The Releasors agree to defend, indemnify and hold harmless the Releasees from (a) any and all claims, loss, liability, damages or costs by any person, firm, corporation or other entity claiming by, through or under Releasors in any capacity whatsoever, including all subrogation claims and/or claims for reimbursement, including any court costs and attorneys fees, that may incur due to Releasors use of or presence in and on City of Pawtucket property; and (b) any and all legal actions, including third-party actions, cross-actions, and/or claims for contribution and/or indemnity with respect to any claims by any other persons, entities, parties, which relate to or arise out of Releasors use of or presence in and on City of Pawtucket property.

The Releasors acknowledge the risks that may be involved and hazards connected with use of or presence in and on City of Pawtucket property but elect to provide services under any contract with the City of Pawtucket with full knowledge of such risks. Releasors also acknowledge that any loss, damage, and/or injury sustained by Releasors is not covered by Releasees insurance. Releasors agree to become fully aware of any safety risks involved with the performance of services under any contract with the City of Pawtucket and any safety precautions that need to be followed and agree to take all such precautions.

The duty to indemnify and/or hold harmless the City of Pawtucket shall not be limited by the insurance required under the City of Pawtucket Terms and Conditions of Purchase.

## **7.0 - Additional Insurance Requirements**

In addition to the insurance provisions in the City of Pawtucket Terms and Conditions of Purchase, the liability insurance coverage, except Professional Liability, Errors and Omissions or Workers' Compensation insurance required for performance of a contract with the City of Pawtucket shall include the City of Pawtucket, its divisions, officers and employees as Additional Insureds but only with respect to the selected vendor's activities under the contract. The insurance required through a policy or endorsement shall include:

- A. a Waiver of Subrogation waiving any right to recovery the insurance company may have against the City of Pawtucket; and
- B. a provision that the selected vendor's insurance coverage shall be primary with respect to any insurance, self insurance or self retention maintained by the City of Pawtucket and that any insurance, self insurance or self retention maintained by the City of Pawtucket shall be in excess of the selected vendor's insurance and shall not contribute.

There shall be no cancellation, material change, potential exhaustion of aggregate limits or non-renewal without thirty (30) days written notice from the selected vendor or its insurer(s) to the City of Pawtucket's Purchasing Agent. Any failure to comply with the reporting provision of this clause shall be grounds for immediate termination of the contract with the City of Pawtucket.

Insurance coverage required under the contract shall be obtained from insurance companies acceptable to the City of Pawtucket. The selected vendor shall pay for all deductibles, self insured retentions and/or self insurance included hereunder.

The City of Pawtucket's Purchasing Agent reserves the right to consider and accept alternative forms and plans of insurance or to require additional or more extensive coverage for any individual requirement.

## 8.0 - Proposal Content and Organization

All bids must be submitted on the forms supplied in Section 11.0 and shall be subject to all requirements of the Contract Documents, including these instructions to bidders. All bids must be regular in every respect and no interlineations, excisions or special conditions shall be made or included in the Bid Form by the Bidder. Pricing must include all costs as specified in this solicitation.

The Owner may consider as irregular any Bid on which there is an alteration of or departure from the Bid Form hereto attached and at its option may reject the same.

Bid Documents, including the Bid, the Bid Bond, the Non-Collusion Affidavit, the Anti-Kickback Acknowledgment, and the Statement of Bidder's Qualifications (if requested) shall be enclosed in a sealed envelope which shall be clearly labeled with the words, "**Fire Station #2 Interior Renovations, Bid #22-014**", as well as name of Bidder, and date of bid opening.

All Bid Forms must be signed.

If the Contract is awarded, it will be awarded by the Owner to a responsible Bidder on the basis of the lowest qualified bid price and the selected Alternative Bid items, if any.

Vendors must include on the Bid Form a list of at least four (4) references with whom they have contracted to do similar work by including the company name, telephone number, contact person, and number of years they have served this customer. Preferably, references should be municipalities which are of approximate size as the City of Pawtucket, and a website address should be included if available.

Respondents must also include an overview of their company's experience including, but not limited to, the number of years the company has been providing these services, the size of the company (including the number of employees and locations), a description of work undertaken that is similar to what is being requested in this RFP, and, if applicable, certifications that show a knowledge of equipment that would be serviced or provided under this contract.

If any subcontractors are to be used in the performance of any work contracted for under this RFP, please list their name(s), contractor license #, address and phone number, and specific description of the subcontract work to be performed. See Proposed Subcontractors form.

Two (2) copies of your proposal—one (1) original hard copy and one digital (1) copy on CD or similar format—must be submitted at the time of submission. Proposals must be in the following format:

- Bid Form

- Company overview

  - Length of time your firm has been in business

  - Length of time at current address

- All licensing (List types and business license number(s)), certification and permits as required in the Scope of Work

Please state any and all additions, deletions, and exceptions, if any, that you are taking to any portion of this proposal. If not addressed specifically, the City of Pawtucket assumes that the vendor will adhere to all terms and conditions listed in this RFP.

Submission of a proposal is acknowledgement and acceptance of the City of Pawtucket's Purchasing Rules and Regulations and General Terms and Conditions of Purchase.

## **9.0 - Evaluation Criteria**

The evaluation of proposals will be conducted in a time frame convenient to the City.

The City of Pawtucket reserves the right to award on the basis of cost alone, accept or reject any or all proposals, and to otherwise act in its best interest including, but not limited to, directly negotiating with any Vendor who submits a proposal in response to this RFP and to award a contract based upon the results of those negotiations alone. The City reserves the right to consider as unqualified to do the work of general construction any Bidder who does not habitually perform with his own forces the major portions of the work involved in construction of the Improvements embraced in this Contract.

Further, the City reserves the right to waive irregularities it may deem minor in its consideration of proposals.

Proposals found to be technically or substantially non-responsive at any point in the evaluation process will be rejected and not considered further. The City of Pawtucket may elect to require presentations(s) by vendors in consideration for award.

Proposals will be evaluated in three (3) phases:

1. The first phase is an initial review to determine if the proposal, as submitted, is complete. To be complete, a proposal must meet all the requirements of this RFP.
2. The second phase is an in-depth analysis and review based on criteria below and their associated weights.

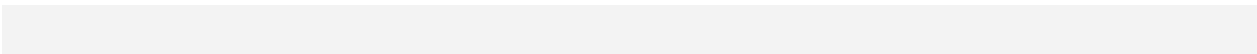
<u>Evaluation Criteria</u>	<u>Importance</u>
Experience/Qualifications	20%
References	10%
Price	70%

3. The third is a comparison of each proposal's weighted evaluation relative to the costs proposed.

In the event that the City requires further information and/or a demonstration of any equipment or process offered in any proposal, all vendors asked for same will do so at no cost to the City.

## **10.0 - Miscellaneous**

- Vendors shall at all times comply with all federal, state, and local laws, ordinances and regulations and shall defend, indemnify and save harmless the City of Pawtucket against any claims arising from the violation of any such laws, ordinances and regulations, including but not limited to challenges as to the legality of any and all vendor installations.

- The City is exempt from the payment of the Rhode Island State Sales Tax under the 1956 General Laws of the State of Rhode Island, 44-18-30, Paragraph 1, as amended. Further, the City is also exempt from the payment of any excise or federal transportation taxes. The proposal prices submitted must be exclusive of same, and will be so construed.
  - The City of Pawtucket reserves the right to cancel an agreement with the Vendor with thirty (30) days written notice and to award the contract to the next highest evaluated bidder.
  - The City of Pawtucket reserves the right to renegotiate the terms of this contract with the Vendor for subsequent years provided the Vendor agrees to the contract terms for the renewal period.
  - The payment and performance of any obligations under this contract for years beyond the first fiscal year are subject to the availability of funds.
  - The City reserves the right to pay the selected Vendor via credit card at its sole discretion.
- 

# 11.0 – Bid Form

## 22-014 – Fire Station #2 Interior Renovations

Date: \_\_\_\_\_

Submitted By: \_\_\_\_\_

(Include Name, Address and Telephone No.) \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Name and remittance address that will appear on invoices:

Physical address of business:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### General Information

Is your firm a sole proprietorship doing business under a different name? \_\_\_\_ Yes \_\_\_\_ No

If yes, please indicate sole proprietorship, a name, and the name you are doing business under.

\_\_\_\_\_

\_\_\_\_\_

Is your firm incorporated? \_\_\_\_ Yes \_\_\_\_ No

Will any of the work spelled out in this bid be outsourced? \_\_\_\_ Yes \_\_\_\_ No

If so, please explain below:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Have you or your firm been subject to suspension, debarment or criminal conviction by the City of Pawtucket, the State of Rhode Island, or any other jurisdiction?

Yes: \_\_\_\_\_ No: \_\_\_\_\_

Have the City of Pawtucket and/or the State of Rhode Island ever terminated contracts with your firm for cause?

Yes: \_\_\_\_\_ No: \_\_\_\_\_

Has your firm ever withdrawn from a contract with the City of Pawtucket and/or the State of Rhode Island during its performance?

Yes: \_\_\_\_\_ No: \_\_\_\_\_

Have you or your firm been involved in litigation against the City of Pawtucket and/or the State of Rhode Island.

Yes: \_\_\_\_\_ No: \_\_\_\_\_

If you answered yes to any of the foregoing, please explain the circumstances below. If you or your firm has been involved in litigation against the City of Pawtucket and/or the State of Rhode Island, please include the case caption, case number and status. (If more space is needed, please attach separate sheet and submit with the bid.)

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Is your company bonded? Yes \_\_\_\_ No \_\_\_\_

Please describe the nature and extent of all insurance coverage:

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Addenda

The following Addenda have been received. The noted modifications to the Bidding Documents have been considered and all costs are included in the Bid Sum.

Addendum #1, Dated: \_\_\_\_\_

Addendum #2, Dated: \_\_\_\_\_

Addendum #3, Dated: \_\_\_\_\_



References

Please list at least four (4) companies' with whom you have contracted to provide similar services. Preferably, references should be municipalities which are of approximate size as the City of Pawtucket, and a website address should be included if available.

Reference #1  
Company Name: \_\_\_\_\_  
Contact Person: \_\_\_\_\_ Telephone #: \_\_\_\_\_  
Contract Dates: \_\_\_\_\_ To \_\_\_\_\_  
Website Address: \_\_\_\_\_

Reference # 2  
Company Name: \_\_\_\_\_  
Contact Person: \_\_\_\_\_ Telephone #: \_\_\_\_\_  
Contract Dates: \_\_\_\_\_ To \_\_\_\_\_  
Website Address: \_\_\_\_\_

Reference # 3  
Company Name: \_\_\_\_\_  
Contact Person: \_\_\_\_\_ Telephone #: \_\_\_\_\_  
Contract Dates: \_\_\_\_\_ To \_\_\_\_\_  
Website Address: \_\_\_\_\_

Reference # 4  
Company Name: \_\_\_\_\_  
Contact Person: \_\_\_\_\_ Telephone #: \_\_\_\_\_  
Contract Dates: \_\_\_\_\_ To \_\_\_\_\_  
Website Address: \_\_\_\_\_

## Pricing Proposal

22-014

### 1.00 OFFER:

- A. Having examined the Place of the Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by William Starck Architects, Inc. (Architect for the above mentioned project) and the City of Pawtucket, we, the undersigned, hereby offer to enter into a Contract to perform the Work, **Fire Station #2 Interior Renovations**, for the amount indicated below, subject to the additions and deductions according to the terms of the Contract Documents and as stated below. The undersigned will provide all necessary and proper material, machinery, equipment, facilities, and means to complete the Work.
- B. The undersigned hereby understands that the City of Pawtucket (Owner) has the right to reject any and all bids and to award the contract in the best interests of the Owner. The Owner reserves the right to award the entire project or delete portions of the work to funds available, whichever is in the best interest of the Owner.
- C. The undersigned also understands that the contract must be carried out in strict accordance with the contract documents.

NOTE: THE UNIT PRICE FOR EACH ITEM MUST BE WRITTEN IN WORDS AND FIGURES. IN CASE OF DISCREPANCY, THE AMOUNT SHOWN IN WORDS WILL GOVERN.

BID ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT BID PRICE	SUBTOTAL COST
1	Base Bid for Renovations	LS	1		
Unit Price in Words:					
2	<u>Alternate Add/Deduct – Floor Drain</u> (See Alternate in Appendix E & F of this RFP)	LS	1		
Unit Price in Words:					
3	OWNER CONTINGENCY (See Section 1.01 Below)	N/A	N/A	\$15,000	15,000
Unit Price in Words: Fifteen Thousand Dollars and Zero Cents.					

### 1.01 ALLOWANCES:

As part of the Base Bid (Total Bid), the bidder to carry a **contingency-based fee of \$15,000** to support potential expansions of the Project scope, none of which shall be authorized without the Owner's express written consent. The Owner reserves the right to remove these items from the contract totally or in part and to adjust the contract sum to reflect the actual costs of the construction authorized by the Owner. Unit prices reflect replacement with suitable materials.

1.02 BID ALTERNATES:

Alternates as quoted are for provision of unit price adjustments to the Base Bid prior to Contract Award. The Bidder shall indicate in the appropriate field whether the Alternate results in an ADD or DEDUCT to the Base Bid unit price. The Alternate ADD or DEDUCT indicated will adjust the Base Bid unit price by the stated amount, not replace the Base Bid unit price, provided that the Alternate is selected by the Owner.

Alternates will be executed at the Owner's option. One or more alternates may be chosen. Accepted Alternates will be listed in the Owner/Contractor Agreement.

**ALT-1 (Description)**

ADD/DEDUCT	UNIT BID PRICE ADJUSTMENT	TOTAL COST ADJUSTMENT
----- (indicate add or deduct)	----- (figures)	----- (figures)

TOTAL COST ADJUSTMENT IN WORDS: \_\_\_\_\_

2.00 ACCEPTANCE:

If this Bid is accepted within the time stated in the contract documents, and we fail to commence the Work, the Bid Bond shall be forfeited as damages to the Owner by reason of our failure, limited in amount to the lesser of the face value of the Bid Bond or the difference between this Bid and the Bid upon which the Contract is executed.

In the event our Bid is not accepted within the time stated in the contract documents, the required Bid Bond shall be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

The City of Pawtucket reserves the right to increase or decrease the quantities stated in the bid at the unit prices quoted.

3.00 BID FORM SIGNATURE(S)

The Corporate Seal of

---

(Bidder - please print the full name of your Proprietorship, Partnership, or Corporation)

was hereunto affixed in the presence of:

---

(Authorized signing officer      Title)

(Seal)

---

(Authorized signing officer      Title)

If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.

**NON-COLLUSION AFFIDAVIT OF PRIME BIDDER**

State of \_\_\_\_\_ )  
County of \_\_\_\_\_ ) .ss

being first duly sworn, deposes and says that;

(1) He is \_\_\_\_\_ (owner, partner, officer, representative or agent) \_\_\_\_\_ of \_\_\_\_\_, the BIDDER that has submitted the attached bid;

(2) He is fully informed respecting the preparation and contents of the attached Bid and all pertinent circumstances respecting such Bid;

(3) Such Bid is genuine and is not a collusive or sham Bid;

(4) Neither the said BIDDER nor any of its officers, partners, owners, agents, representatives, employees, or parties in interest, including the affiant, has in any way colluded, conspired or agreed, directly or indirectly, with any other BIDDER, firm or person to submit a collusive or sham bid in connection with the Contract for which the attached Bid has been submitted or to refrain from bidding in connection with such a 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 Bid or of any other Bidder, or to fix any overhead, profit or cost element of the Bid price or the Bid price of any other BIDDER, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the Local Government or any person interested in the proposed Contract; and

(5) The price or prices quoted in the attached Bid 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 in interest including this affiant.

(Signed) \_\_\_\_\_  
\_\_\_\_\_  
(Title)

Subscribed and sworn to before me  
This \_\_\_\_\_ Day of \_\_\_\_\_, 20\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

My Commission Expires \_\_\_\_\_

## CERTIFICATE OF COMPLIANCE WITH TAX LAWS

I, \_\_\_\_\_ of \_\_\_\_\_, certify under  
*(principal)* *(corporation)*  
pains and penalties of perjury that said corporation has complied with all the laws of the State of Rhode Island and Providence Plantations relating to taxes.

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Federal Tax Identification Number

END OF SECTION

## **12 – General Conditions – AIA Document A201**

### **GENERAL CONDITIONS**

#### **AIA DOCUMENT A201, 2007 EDITION**

### **PART I – GENERAL**

#### **DESCRIPTION**

- A. AIA Document A201, General Conditions of the Contract for Construction, Sixteenth Edition, 2007.

# DRAFT AIA® Document A201™ - 2007

## General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

<< ->>  
<< >>

THE OWNER:

(Name, legal status and address)

<< >>< >>  
<< >>

THE ARCHITECT:

(Name, legal status and address)

<< >>< >>  
<< >>

### ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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

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## ARTICLE 1 GENERAL PROVISIONS

### § 1.1 BASIC DEFINITIONS

#### § 1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding requirements.

#### § 1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

#### § 1.1.3 THE WORK

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

#### § 1.1.4 THE PROJECT

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

#### § 1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

#### § 1.1.6 THE SPECIFICATIONS

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

#### § 1.1.7 INSTRUMENTS OF SERVICE

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

#### § 1.1.8 INITIAL DECISION MAKER

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

### § 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

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



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

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

### § 1.3 CAPITALIZATION

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

### § 1.4 INTERPRETATION

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

### § 1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

§ 1.5.1 The Architect and the Architect’s consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect’s or Architect’s consultants’ reserved rights.

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

### § 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

## ARTICLE 2 OWNER

### § 2.1 GENERAL

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

§ 2.1.2 The Owner shall furnish to the Contractor within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of or enforce mechanic’s lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner’s interest therein.

### § 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner’s obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner’s ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.2 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

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

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

### § 2.3 OWNER'S RIGHT TO STOP THE WORK

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

### § 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

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

## ARTICLE 3 CONTRACTOR

### § 3.1 GENERAL

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

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

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

### § 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These

obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

### § 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

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

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

### § 3.4 LABOR AND MATERIALS

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

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

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

### § 3.5 WARRANTY

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

### § 3.6 TAXES

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

### § 3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

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

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

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

§ 3.7.4 **Concealed or Unknown Conditions.** If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

### § 3.8 ALLOWANCES

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 Allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- .3 Whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

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

### § 3.9 SUPERINTENDENT

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

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

### § 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

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

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

### § 3.11 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

### § 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

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

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

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

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

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors.

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

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

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

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

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

### § 3.13 USE OF SITE

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

### § 3.14 CUTTING AND PATCHING

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

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

### § 3.15 CLEANING UP

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

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

### § 3.16 ACCESS TO WORK

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

### § 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

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

### § 3.18 INDEMNIFICATION

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

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

## ARTICLE 4 ARCHITECT

### § 4.1 GENERAL

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

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

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

## § 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

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

## § 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

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

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

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



techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

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

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

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

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

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

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

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

## ARTICLE 5 SUBCONTRACTORS

### § 5.1 DEFINITIONS

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

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

### § 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

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

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

### § 5.3 SUBCONTRACTUAL RELATIONS

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

### § 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

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

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

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

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

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

## ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

### § 6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

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

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

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

## § 6.2 MUTUAL RESPONSIBILITY

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

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

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

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

§ 6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

## § 6.3 OWNER'S RIGHT TO CLEAN UP

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

# ARTICLE 7 CHANGES IN THE WORK

## § 7.1 GENERAL

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

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

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

## § 7.2 CHANGE ORDERS

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

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

## § 7.3 CONSTRUCTION CHANGE DIRECTIVES

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

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

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

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

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

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

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

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

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

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be

reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

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

#### § 7.4 MINOR CHANGES IN THE WORK

The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

### ARTICLE 8 TIME

#### § 8.1 DEFINITIONS

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

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

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

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

#### § 8.2 PROGRESS AND COMPLETION

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

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

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

#### § 8.3 DELAYS AND EXTENSIONS OF TIME

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

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

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

### ARTICLE 9 PAYMENTS AND COMPLETION

#### § 9.1 CONTRACT SUM

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

#### § 9.2 SCHEDULE OF VALUES

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as

the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

### § 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents.

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

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

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

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

### § 9.4 CERTIFICATES FOR PAYMENT

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

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

### § 9.5 DECISIONS TO WITHHOLD CERTIFICATION

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to

make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a separate contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

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

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

#### § 9.6 PROGRESS PAYMENTS

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

§ 9.6.2 The Contractor shall pay each Subcontractor no later than seven days after receipt of payment from the Owner the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

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

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

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

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

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

## § 9.7 FAILURE OF PAYMENT

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

## § 9.8 SUBSTANTIAL COMPLETION

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

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

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

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

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

## § 9.9 PARTIAL OCCUPANCY OR USE

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

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

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.



## § 9.10 FINAL COMPLETION AND FINAL PAYMENT

§ 9.10.1 Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

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

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

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

- .1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents; or
- .3 terms of special warranties required by the Contract Documents.

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

## ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

### § 10.1 SAFETY PRECAUTIONS AND PROGRAMS

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

### § 10.2 SAFETY OF PERSONS AND PROPERTY

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

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

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

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

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

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

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

#### § 10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY

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

#### § 10.3 HAZARDOUS MATERIALS

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

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

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from

performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity.

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

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

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

#### § 10.4 EMERGENCIES

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

### ARTICLE 11 INSURANCE AND BONDS

#### § 11.1 CONTRACTOR'S LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- .1 Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;
- .2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- .3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- .4 Claims for damages insured by usual personal injury liability coverage;
- .5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- .6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
- .7 Claims for bodily injury or property damage arising out of completed operations; and
- .8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An

additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

#### § 11.2 OWNER'S LIABILITY INSURANCE

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

#### § 11.3 PROPERTY INSURANCE

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

#### § 11.3.2 BOILER AND MACHINERY INSURANCE

The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

### § 11.3.3 LOSS OF USE INSURANCE

The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

### § 11.3.7 WAIVERS OF SUBROGATION

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgage clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

## § 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

§ 11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

## ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

### § 12.1 UNCOVERING OF WORK

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

### § 12.2 CORRECTION OF WORK

#### § 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

#### § 12.2.2 AFTER SUBSTANTIAL COMPLETION

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct

the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

### § 12.3 ACCEPTANCE OF NONCONFORMING WORK

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

## ARTICLE 13 MISCELLANEOUS PROVISIONS

### § 13.1 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

### § 13.2 SUCCESSORS AND ASSIGNS

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

### § 13.3 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

### § 13.4 RIGHTS AND REMEDIES

§ 13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach there under, except as may be specifically agreed in writing.

### § 13.5 TESTS AND INSPECTIONS

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

§ 13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

### § 13.6 INTEREST

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

### § 13.7 TIME LIMITS ON CLAIMS

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

## ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

### § 14.1 TERMINATION BY THE CONTRACTOR

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

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

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

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.



## § 14.2 TERMINATION BY THE OWNER FOR CAUSE

### § 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

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

## § 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

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

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

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

## § 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

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

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

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

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

## ARTICLE 15 CLAIMS AND DISPUTES

### § 15.1 CLAIMS

#### § 15.1.1 DEFINITION

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

#### § 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

#### § 15.1.3 CONTINUING CONTRACT PERFORMANCE

Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

#### § 15.1.4 CLAIMS FOR ADDITIONAL COST

If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

#### § 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

#### § 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

### § 15.2 INITIAL DECISION

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise,

or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

### § 15.3 MEDIATION

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

### § 15.4 ARBITRATION

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually

agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

#### § 15.4.4 CONSOLIDATION OR JOINDER

§ 15.4.4.1 Either party, at its sole discretion, may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Either party, at its sole discretion, may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as the Owner and Contractor under this Agreement.

**END SECTION AIA A201**

## **12.1 – Addendum To General Conditions – AIA Document A201**

### GENERAL CONDITIONS

- A. Standard Form: The General Conditions of the Contract forming a part of the Contract Documents and of these Specifications, consists of AIA Document A201, 2007 Edition.
- B. Modifications and Additions: Where Contract Documents refer to General Conditions, such reference shall be interpreted to include Addendum to General Conditions.
- C. Where contract documents refer to “architect”, such reference shall be interpreted to be “engineer”.

### CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

- A. If conflicts or discrepancies occur in the Contract Documents, interpretations will be based on the following priorities:
  - 1. Awarding Authority-Contractor Agreement.
  - 2. Addenda, with those of later date having precedence over those of earlier date.
  - 3. The Supplementary Conditions.
  - 4. The General Conditions of the Contract for Construction.
  - 5. Drawings and Specifications.
- B. For an inconsistency between Drawings and Specifications or within either Document not clarified by Addendum, the better quality or greater quantity of work shall be provided according to the Architect's interpretation.

### ARTICLE 2 - OWNER

Sub-paragraph 2.1.2- delete in its entirety

### ARTICLE 7 – CHANGES IN THE WORK

Sub-paragraph 7.3.4- delete in its entirety

### ARTICLE 11 – INSURANCE AND BONDS

Sub-paragraph 11.3- delete in its entirety.

## **13 – Supplementary Conditions**

### **100.0 CLAIMS FOR EXTRA COST**

100.1 If the Contractor claims that any instructions by Drawings or otherwise involve extra cost or extension of time, they shall, within ten (10) days after the receipt of such instructions, and in any event before proceeding to execute the work, submit their protest thereto in writing to the Owner stating clearly and in detail the basis of his objections. No such claim will be considered unless so made.

100.2 Claims for additional compensation for extra work, due to alleged errors in ground elevations, contour lines, site location, or bench marks, will not be recognized unless accompanied by certified survey data, made prior to the time the original ground was disturbed, clearly showing that errors exist which resulted, or would result, in handling more material or performing more work than would be reasonably estimated from the Drawings and map issued.

100.3 Any discrepancies which may be discovered between actual conditions and those represented by the Drawings and maps shall at once be reported to the Owner and work shall not proceed except at the Contractor's risk, until written instructions have been received by them from the Owner.

100.4 If, on the basis of the available evidence, the Owner determines that an adjustment of the Contract Price and/or Time is justifiable, the procedure shall be as provided in Section 110 hereof.

### **101.0 TERMINATION, DELAYS, AND LIQUIDATED DAMAGES**

101.1 Termination of Contract. If the Contractor refuses or fails to prosecute the work with such diligence as will insure its completion within the time specified in these Contract Documents, or as modified as provided in these Contract Documents, the Owner by written notice to the Contractor, may terminate the Contractor's right to proceed with the work. Upon such termination, the Owner may take over the work and prosecute the same to completion of the work and the Contractor shall also be liable to the Owner in its completion of the work and the Contractor shall also be liable to the Owner for liquidated damages for any delay in the completion of the work as provided below. If the Contractor's right to proceed is so terminated, the Owner may take possession of and utilize in completing the work, such materials, tools, equipment, and plant as may be on the site of the work and necessary therefore.

101.2 Liquidated Damages for Delays. If the work be not completed within the time stipulated in Section 402 hereof, including any extensions of time for excusable delays as herein provided, the Contractor shall pay to the Owner as fixed, agreed, and liquidated damages (it being impossible to determine the actual damages occasioned by the delay) for each calendar day of delay, until the work is completed, the amount as set forth in Section 403 hereof and the Contractor and his sureties shall be liable to the Owner for the amount thereof.

101.3 Excusable Delays. The right of the Contractor to proceed shall not be terminated nor shall the Contractor be charged with liquidated damages for any delays in the completion of the work due.

101.3.1 To any acts of the Government, including controls or restrictions upon or requisitioning of materials, equipment, tools, or labor by reason of war, National Defense, or any other national emergency.

101.3.2 To any acts of the Owner.

101.3.3 To causes not reasonably foreseeable by the parties to this Contract at the time of the execution of the Contract which are beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God or of the Public enemy, acts of another Contractor in the performance of some other contract with the Owner, fires, floods, epidemics, quarantine, restrictions, strikes, freight embargoes, and weather of unusual severity such as hurricane, tornadoes, cyclones and other extreme weather conditions; and

101.3.4 To any delay of any subcontractor occasioned by any of the causes specified in subparagraphs 1, 2 and 3 of this paragraph 101.3.

Provided, however, that the Contractor promptly notify the Owner within ten (10) days in writing of the cause of the delay. Upon receipt of such notification, the Owner shall ascertain the facts and the cause and extent of delay. If, upon the basis of the facts and the terms of this contract, the delay is properly excusable, the Owner shall extend the time for completing the work for a period of time commensurate with the period of excusable delay.

## 102.0 SAMPLES, CERTIFICATES AND TESTS

102.1 The Contractor shall submit all material or equipment samples, certificates, affidavits, etc. as called for in the contract documents or required by the Owner promptly after award of the Contract and acceptance of the Contractor's bond. No such material or equipment shall be manufactured or delivered to the site, except at the Contractor's own risk, until the required samples or certificates have been approved in writing by the Owner. Any delay in the work caused by late or improper submission of samples or certificates for approval shall not be considered just cause for an extension of the contract time.

Each sample submitted by the Contractor shall carry a label giving the name of the Contractor, the property for which it is intended, and the name of the producer. The accompanying certificate or letter from the Contractor shall state that the sample complies with contract requirements, shall give the name and brand of the products, its place or origin, the name and address of the producer and all specifications or other detailed information which will assist the Owner in passing upon the acceptability of the sample promptly. It shall also include the statement that all materials or equipment furnished for use in the project will comply with the samples and/or certified statements.

102.2 Approval of any materials shall be general only and shall not constitute a waiver of the Owner's right to demand full compliance with Contract requirements. After actual deliveries, the Owner will have such check tests made as they deem necessary in each instance and may reject materials and equipment and accessories for cause, even though such materials and articles have been given general approval. If materials, equipment or accessories, which fail to meet check tests have been incorporated in the work, the Owner will have the right to cause their removal and replacement by proper materials or to demand and secure such reparation by the Contractor as is equitable.

102.3 Except as otherwise specifically stated in the Contract, the costs of sampling and testing will be divided as follows:

102.3.1 The Contractor shall furnish without extra cost, including packing and delivery charges, all samples required for testing purposes except those samples taken on the project by the Owner;

102.3.2. The Contractor shall assume all costs of re-testing materials which fail to meet contract requirements;

102.3.3 The Contractor shall assure all cost of testing materials offered in substitution of those found deficient; and

102.3.4 The Owner will pay all other expenses.

#### 103.0 PERMITS AND CODES

103.1 The Contractor shall give all notices required by and comply with all applicable laws, ordinances, and codes of the Local Government. All construction work and/or utility installations shall comply with all applicable ordinances, and codes including all written waivers. Before installing any work, the Contractor shall examine the Drawings and Technical Specifications for compliance with applicable ordinances and codes and shall immediately report any discrepancy to the Owner. Where the requirements of the Drawings and Technical Specifications fail to comply with such applicable ordinances or codes, the

Owner will adjust the Contract by Change Order to conform to such ordinances or codes (unless waivers in writing covering the difference have been granted by the governing body or department) and make appropriate adjustment in the Contract Price or stipulated unit prices.

Should the Contractor fail to observe the foregoing provisions and proceed with the construction and/or install any utility at the variance with any applicable ordinance or code, including any written waivers (notwithstanding the fact that such installation is in compliance with the Drawings and Technical Specifications), the Contractor shall remove such work without cost to the Owner, but a Change Order will be issued to cover only the excess cost the Contractor would have been entitled to receive if the Change had been made before the Contractor commenced work on the items involved.

103.2 The Contractor shall at their own expense, secure and pay to the appropriate department of the Local Government the fees or charges for all permits for street pavement, sidewalks, sheds, removal of abandoned water taps, sealing of house connection drains, pavement cuts, buildings, electrical, plumbing, water, gas and sewer permits required by the local regulatory body or any of its agencies.

103.3 The Contractor shall comply with applicable local laws and ordinances governing excavations and the disposal of surplus excavation, materials, debris and rubbish on or off the Project Area and commit no trespass on any public or private property in any operation due to or connected with the Improvements embraced in this Contract.

#### 104.0 CARE OF WORK

104.1 The Contractor shall be responsible for all damages to person or property that occur as a result of their fault or negligence in connection with the prosecution of the work and shall be responsible for the proper care and protection of all materials delivered and work performed until completion and final acceptance, whether or not the same has been covered in whole or in part by payments made by the Owner.

104.2 The Contractor shall provide, where necessary and as requested by the Owner, sufficient competent watchmen, both day and night, including Saturdays, Sundays, and holidays, from the time the work is commenced until final completion and acceptance.

104.3 In an emergency affecting and safety of life, limb or property, including adjoining property, the Contractor without special instructions or authorization from the Owner is authorized to act at their discretion to prevent such threatened loss or injury, and they shall so act. They shall likewise act if instructed to do so by the Owner. Any compensation claimed by the Contractor on account of such emergency work will be determined by the Owner as provided in Section 110 hereof.



104.4 The Contractor shall avoid damage as a result of their operations to existing sidewalks, streets, curbs, pavements, utilities, (except those which are to be replaced or removed), adjoining property, etc., and they shall at their own expense completely repair any damage thereto caused by their operations.

104.5 The Contractor shall shore up, brace, underpin, secure, and protect as may be necessary, all foundations and other parts of existing structures adjacent to, adjoining, and in the vicinity of the site, which may be in any way affected by the excavations or other operations connected with the construction of the Improvements embraced in this Contract. The Contractor shall be responsible for the giving of any and all required notices to any adjoining or adjacent property Owner or other party before the commencement of any work. The Contractor shall indemnify and save harmless the Owner from any damages on account of settlements or the loss of lateral support of adjoining property and from all loss or expense and all damages for which the Owner may become liable in consequence of such injury of damage to adjoining and adjacent structures and their premises.

#### 105.0 ACCIDENT PREVENTION

105.1 The Contractor shall exercise proper precaution at all times for the protection of persons and property and shall be responsible for all damages to persons or property, either on or off the site, which occur as a result of his prosecution of the work. The safety provisions of applicable laws and building and construction codes shall be observed and the Contractor shall take or cause to be taken such additional safety and health measures as the Owner may determine to be reasonably necessary. Machinery, equipment and all hazards shall be guarded in accordance with the safety provisions of the "Manual of Accident prevention in Construction" published by the Associates General Contractors of America, Inc., to the extent that such provisions are not in conflict with applicable local laws.

105.2 The Contractor shall maintain an accurate record of all cases of death, occupational disease, or injury requiring medical attention or causing loss of time from work, arising out of and in the course of employment on work under the Contract. The Contractor shall promptly furnish the Owner with reports concerning these matters.

105.3 The Contractor shall indemnify and save harmless the Owner from any claims for damages resulting from property damage, personal injury and/or death suffered or alleged to have been suffered by any person as a result of any work conducted under this Contract.

#### 106.0 USE OF PREMISES

106.1 The Contractor shall confine their equipment, storage of materials and construction operations to the Contract limits as shown on the Drawings and as prescribed by ordinances or permits, or as may be desired by the Owner and shall not unreasonably encumber the site or public rights of way with his materials and construction equipment.

106.2 The Contractor shall comply with all reasonable instructions of the Owner and the ordinances and codes of the Local Government, regarding signs, advertising, traffic, fires, explosives, danger signals, barricades and fire prevention.

#### 107.0 REMOVAL OF DEBRIS, CLEANING, ETC.

The Contractor shall, periodically or as directed during the progress of the work, remove and legally dispose of all surplus excavated material and debris, and keep the Project Area and public rights of way reasonably clear. Upon completion of the work, the Contractor shall remove all temporary construction facilities, debris and unused materials provided for the work, and put the work site of the work and public rights of way in a neat and clean condition. Trash burning

on the site of the work will be subject to prior approval of the Owner and existing State and Local regulations.

#### 108.0 INSPECTION

108.1 All materials and workmanship shall be subject to inspection, examination, or test by the Owner and the Engineer at any and all times during manufacture of construction and at any and all places where such manufacture or construction is carried on. The Owner shall have the right to reject defective material and workmanship or require its correction. Unacceptable workmanship shall be satisfactorily corrected. Rejected material shall be promptly segregated and removed from the Project Area and replaced with material of specified quality without charge therefore. If the Contractor fails to proceed at once with correction of rejected workmanship or defective material, the Owner may by Contract or otherwise have the defects remedied or rejected materials removed from the Project Area and charge the cost of the same against any monies which may be due the Contractor, without prejudice to any other rights or remedies of the Owner.

108.2 The Contractor shall furnish promptly all materials reasonably necessary for any tests, which may be required. (See Section 102 hereof). All tests by the Owner will be performed in such manner as not to delay the work unnecessarily and will be made in accordance with the provisions of the Technical Specifications.

108.3 The Contractor shall notify the Owner sufficiently in advance of backfilling or concealing any facilities to permit proper inspection. If any facilities are concealed without approval or consent of the Owner, the Contractor shall uncover for inspection and recover such facilities all at their own expense, when so requested by the Owner.

Should it be considered necessary or advisable by the Owner at any time before final acceptance of the entire work to make an examination of work already completed by uncovering the same, the Contractor shall on request promptly furnish all necessary facilities, labor, and material. If such work is found to be defective in any important or essential respect, due to fault of the Contractor or their subcontractors, the Contractor shall defray all the expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, the actual cost of labor and material necessarily involved in the examination and replacement, plus 15 percent of such costs to cover superintendence, general expenses and profit, shall be allowed by the Contractor and they shall, in addition, if completion of the work of the entire Contract has been delayed thereby, be granted a suitable extension of time on account of the additional work involved.

108.4 Inspection of materials and appurtenances to be incorporated in the Improvements embraced in this Contract may be made at the place of production, manufacture or shipment, whatever the quantity justifies it, and such inspection and acceptance, unless otherwise stated in the Technical Specifications, shall be final, except as regards (1) latent defects, (2) departures from specific requirements of the Contract, (3) damage or loss in transit, or (4) fraud or such gross mistakes as amount to fraud. Subject to the requirements contained in the preceding sentence, the inspection of materials as a whole or in part will be made at the Project Site.

108.5 Neither inspection, testing, approval nor acceptance of the work in whole or in part, by the Owner or its agents shall relieve the Contractor of their sureties of full responsibility for materials furnished or work performed not in strict accordance with the Contract.

#### 109.0 REVIEW BY THE OWNER

The Owner, its authorized representatives and agents and the Representative for the Secretary (as defined under GENERAL CONDITIONS, PART II) shall, at all times, have access to, and be permitted to observe and review all work, materials, equipment, payrolls, personnel records,

employment conditions, material invoices, and other relevant data and records pertaining to this Contract, provided, however, that all instructions and approval with respect to the work will be given to the Contractor only by the Owner through its authorized representatives or agents.

#### 110.0 FINAL INSPECTION

110.1 When the Improvements embraced in this Contract are substantially completed, the Contractor shall notify the Owner in writing that the work will be ready for final inspection on a definite date, which shall be stated in the notice. The notice will be given at least ten (10) days prior to the date stated for final inspection, and bear the signed concurrence of the representative of the Owner having charge of inspection. If the Owner determines that the status of the Improvements is as represented, it will make the arrangements necessary to have final inspection commenced on the date stated in the notice, or as soon thereafter as is practicable. The inspection party will include representatives of each department of the Local Government having in charge Improvements of like character when such Improvements are later to be accepted by the Local Government.

#### 111.0 DEDUCTION FOR UNCORRECTED WORK

If the Owner deems it not expedient to require the Contractor to correct work not done in accordance with the Contract Documents, an equitable deduction from the Contract Price will be made by agreement between the Contractor and the Owner and subject to settlement, in case of dispute, as herein provided.

#### 112.0 INSURANCE

See Section 5.0 Insurance for information.

#### 113.0 PATENTS

The Contractor shall hold and save the Owner its officers, and employees, harmless from liability of any nature of kind, including costs and expenses, for, or on account of, any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the Contract, including its use by the Owner unless otherwise specifically stipulated in the Technical Specifications.

#### 114.0 WARRANTY OF TITLE

No material, supplies, or equipment to be installed or furnished under this Contract shall be purchased subject to any chattel mortgage or under a conditioned sale, lease-purchase or other agreement by which an interest therein or in any part thereof is retained by the seller or supplier. The Contractor shall warrant good title to all materials, supplies, and equipment installed or incorporated in the work and upon completion of all work, shall deliver the same together with all improvements and appurtenances constructed or placed thereon by them to the Owner free from any claims, liens, or charges. Neither the Contractor nor any person, firm or corporation furnishing any material or labor for any work covered by this Contract shall have any right to a lien upon any improvement or appurtenance thereon. Nothing contained in this paragraph, however, shall defeat or impair the right of persons furnishing materials or labor to recover under any bond given by the Contractor for their protection or any rights under any law permitting such persons to look to funds due the Contractor in the hands of the Owner. The provisions of this paragraph shall be inserted in all subcontracts and materials contracts and notice of its provisions shall be given to all persons furnishing materials for the work when no formal Contract is entered into for such materials.

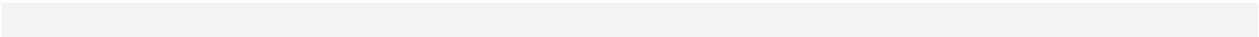
#### 115.0 GENERAL GUARANTY

Neither the final certificate of payment nor any provision in the Contract nor partial or entire use of the Improvements embraced in this Contract by the Owner or the public shall constitute an acceptance of work not done in accordance with the Contract or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall promptly remedy any defects in the work and pay for any damage to other work resulting therefrom, which shall appear within a period of twelve (12) months from the date of final acceptance of the work. The Owner will give notice of defective materials and work with reasonable promptness.

#### 116.0 CONTRACTOR TO MAKE OWN EXAMINATION

Plans, calculations, estimates of quantities, and any statements made in the Instructions to Bidders or otherwise as to the conditions under which the work is to be performed are not guaranteed by the Owner to be correct or to be a complete representation of all existing data on conditions affecting work, and the Contractor agrees that they have made their examination and will make no claim for damages on account of any errors, inaccuracies or omissions that may be found.

The Contractor shall not take any advantage or have any claim for damages on account of any discrepancy, error or omission in any plans, calculations, estimates of quantities, or any statement made in the Instructions to Bidders or otherwise as to the conditions under which the work is to be performed, and they shall report such discrepancy, error or omission to the Owner in writing as soon as it comes to their knowledge, and before proceeding with work related to such discrepancy, error or omission. Any correction or modification of the plans or specifications may be made by the Owner when necessary, in their opinion, for the proper fulfillment of their purpose or for their proper interpretation.



## **14 – Special Conditions**

SPECIAL CONDITIONS FOR

### **Pawtucket City Hall Fire Department Rescue Room and Kitchen Renovations**

#### **402.0 TIME FOR COMPLETION**

The work which the Contractor is required to perform under this Contract shall be commenced at the time stipulated by the Owner in the Notice to Proceed to the Contractor.

The rate of progress shall be such that the whole work shall be performed in accordance with the terms of this contract within the number of calendar days after the date of execution of the contract as herein stipulated, unless the expected as any part may be delayed under the provisions of this contract. The work shall be pursued in a continuous, diligent, and uniform manner throughout the project until completion.

It is agreed that the rates of progress herein required has been purposely made low enough to allow for the ordinary delays incident to construction work of this character. No extension of time will be made for ordinary delays, inclement weather and accidents, and the occurrence of such will not relieve the Contractor from the necessity of maintaining this rate of progress.

If delays are caused by acts of God, acts of Government or State, strikes extra work, floods or other contingencies clearly beyond the control or responsibility of the Contractor, the Contractor shall be entitled to so much additional time wherein to perform and complete this contract on his part as the Engineer shall certify in writing to be just.

#### **403.0 LIQUIDATED DAMAGES**

In case the Contractor fails satisfactorily to complete the entire work contemplated and provided for under this contract on or before the date of completion determined as described above, the Owner shall deduct from the payments due to the Contractor each month the sum of \$100.00 for each calendar day (Sundays and legal holidays excluded) of delay, which sum is agreed upon not as a penalty, but as fixed and liquidated damages, said damages shall be deducted from any other moneys due or to become due the Contractor, and in case such damages exceed the amount of all moneys due or to become due, the Contractor then the Contractor or his Surety shall pay the balance to the Owner.

#### **404.0 RESPONSIBILITIES OF CONTRACTOR**

404.1 Except as otherwise specifically stated in the Contract Documents, and Technical Specifications, the Contract shall provide and pay for all materials, tools, labor, equipment, water, light, heat, power, transportation, superintendence, temporary construction of every nature, charges, levies, fee or other expenses, and all other services and facilities of every nature whatsoever necessary for the performance of the Contract and to deliver all improvements embraced in this Contract complete in every respect within the specified time.

404.2 All materials, workmanship, methods and practices shall conform to the current Standards of the American Water Works Association, the Rhode Island Standard Specifications for Road and Bridge Construction, 2010 edition, including all corrections, all issued compilation of approved specifications, and addendum to date and all general requirements and special requirements

contained in this project specifications. All work zone traffic control shall be in accordance with the manual on uniform traffic control devices, 2009 edition.

404.3 The Contractor shall be responsible for detailed layout, all stakeout and grade control, and shall employ a registered engineer or a registered land surveyor for this purpose as may be necessary. The Owner will provide engineering and inspection.

404.4 The Contractor shall verify dimensions shown on the plans and if any inconsistencies or discrepancies should be noted on the Drawings and the Specifications, he/she shall immediately notify the Owner. The Contractor will be held responsible for any errors resulting from his/her failure to exercise the aforementioned precaution.

404.5 As soon as the Contract is executed, the Contractor shall order any materials necessary and not supplied by the Owner, submit construction schedules as hereinafter specified, and otherwise anticipate the Notice to Proceed. When the Owner gives the Notice to Proceed, the work of construction shall begin at the time stipulated therein and shall be completed within the Time for Completion specified.

404.6 It is the Contractor's responsibility to make his/her own investigation and related assumptions and to satisfy himself as to subsurface conditions and to insure that these are reflected in the prices bid. No change or extra to the price will be accepted due to subsurface conditions or utility locations.

The determination of location and subsequent maintenance and protection of existing subsurface and above ground utilities are the sole responsibility of the Contractor; claims resulting from damage to such by the Contractor will be settled by the Contractor at his/her expense in accordance with the Contract.

404.7 The Contractor shall, at his/her own expense, take out all necessary permits from the county, municipal, or other public authorities; shall give all notices required by law or ordinances; and shall post all bonds and pay all fees and charges incident to the due and lawful prosecution of the work covered by this Contract.

404.8 RESPONSIBILITY FOR MATERIAL FURNISHED BY OWNER: The Contractor's responsibility for material furnished by the Owner shall begin upon Contractor's acceptance at the point of delivery to him. All such material shall be examined, and material defective in manufacture and/or otherwise damaged shall be rejected by the Contractor at the time and place of delivery to him and replaced by the Owner. Material furnished by the Owner which is accepted by the Contractor, but is discovered prior to final acceptance of the work, (1) to be defective in manufacture, shall be replaced by the Owner; (2) to have been damaged before or after acceptance by the Contractor, shall be replaced by the Contractor. Once accepted by the Contractor at the point of delivery to him, all defective and/or damaged material discovered prior to final acceptance of the work shall be removed by the Contractor and he shall install, at his own expense, the material replaced, in its stead, by the Owner or Contractor. In such case, the Contractor shall furnish all labor, equipment, and material incidental to replacement and necessary for the completion of the work to the satisfaction of the Engineer.

404.9 RESPONSIBILITY FOR SAFE STORAGE: The Contractor shall be responsible for the safe storage of all material furnished to or by him and accepted by him until it has been incorporated in the completed project.

#### 405.0 COMMUNICATIONS

405.1 All notices, demands, requests, instructions, approvals, proposals and claims must be in writing.

405.2 Any notice to or demand upon the Contractor shall be sufficiently given if delivered at the office of the Contractor stated on the signature page of the Agreement (or at such other offices as the Contractor may from time to time designate in writing to the Owner), or if deposited in the United States mail in a sealed, postage-prepaid envelope, or delivered with charges prepaid to any telegraph company for translation, in each case addressed to such office.

405.3 All papers; required to be delivered to the Owner shall, unless otherwise specified in writing to the Contractor, be delivered to the CITY OF PAWTUCKET, DEPARTMENT OF PUBLIC WORKS, 250 Armistice Boulevard, Pawtucket, Rhode Island, 02860; any notice to or demands upon the Owner shall be sufficiently given if so delivered, or if deposited in the United States mail in a sealed, postage-prepaid envelope, or delivered with charges prepaid to any telegraph company for transmission to said Owner at such address, or to such other representative of the Owner or to such other address, as the Owner may subsequently specify in writing to the Contractor for such purpose.

405.4 Any such notice shall be deemed to have been given as of the time of actual delivery or (in the case of mailing when the same should have been received in due course of post, or in the case of telegram) at the time of actual receipt, as the case may be.

#### 406.0 PARTIAL USE OF SITE IMPROVEMENTS

The Owner, at its elections may give notice to the Contractor and place in use those sections of the improvements which have been completed, inspected, and can be accepted as complying with the Technical Specifications and if in its opinion, each such section is reasonably safe, fit and convenient, for the use and accommodation for which it was intended, provided;

406.1 The use of such sections of the Improvements shall in no way impede the completion of the remainder of the work by the Contractor.

406.2 The Contractor shall not be responsible for any damages or maintenance costs due directly to the use of such sections.

406.3 The use of such sections shall in no way relieve the Contractor or his liability due to having used defective materials or to poor workmanship.

406.4 The period of guarantee shall not begin to run until the date of the final acceptance of all work which the Contractor is required to construct under this Contract.

#### 407.0 CONTRACT DOCUMENTS AND DRAWINGS

(REDACTED)

#### 408.0 NIGHT, SATURDAY AND SUNDAY WORK

(REDACTED)

#### 409.0 EMPLOY SUFFICIENT LABOR AND EQUIPMENT

If, in the opinion of the Engineer, the Contractor is not employing sufficient labor or equipment to complete this contract within the time specified the Owner may, after giving written notice, require said Contractor to employ such additional labor and equipment as may be necessary to enable said work to progress properly.

#### 410.0 INTOXICATING LIQUORS

The Contractor shall not sell and shall neither permit or suffer the introduction or use of intoxicating liquors upon or about the work embraced in this contract.

#### 411.0 ACCESS TO WORK

The Owner and the Engineer, and their agents and employees may, for purposes already specified and for any other purpose, enter upon the work and the premises used by the Contractor, and the Contractor shall provide safe and proper facilities therefor.

#### 412.0 TIME OF BEGINNING WORK

412.1 Except as herein provided, the Contractor shall commence work at such points as the Engineer may approve, within ten (10) days after the execution of this contract by the Owner.

412.2 Such time of starting may be postponed by written agreement between the Owner and the Contractor because of expected delays in receipt of materials and equipment, or if the season be unsuitable for commencement of the work, or because of other contingency clearly beyond the control or responsibility of the Contractor. Unless stipulated otherwise in said agreement, the Contractor shall commence work at such points as the Engineer may direct or approve, within 10 days after the receipt of a written order from the Owner to start work.

#### 413.0 PROVISIONS FOR TRAFFIC

413.1 The Contractor shall not close or obstruct any portion of a street without obtaining permits for from the proper municipal authorities. If any street or private way shall be rendered unsafe by the Contractor's operations, he shall make such repairs or provide such temporary ways or guards as shall be acceptable to the Owner.

413.2 Streets, roads, private ways, and walks shall be maintained passable by the Contractor at his expense, and the Contractor shall assume full responsibility for the adequacy and safety of provisions made. He shall conduct his construction operations such that interference with the flow of traffic will be held to a minimum.

413.3 The Contractor shall cooperate in every way possible with the municipal authorities maintaining a flow of traffic through the site. The Contractor shall notify the Pawtucket Fire Department when any street is to be closed regardless of the length of time or time of day.

413.4 All detours shall be signed and lighted as directed by the City of Pawtucket.

#### 414.0 COORDINATION WITH OUTSIDE PARTIES

414.1 The Contractor shall conduct his work so as to interfere as little as possible with private business and public travel. He shall at his own expense, wherever necessary or required, maintain fences, furnish watchmen, maintain lights and take such other precautions as may be necessary to protect life and property.

414.2 The Contractor shall take all responsibility for the protection of the work and for preventing injuries to persons and damage to property and utilities on or about the work. He shall not be relieved of his responsibility by any right of the City to give permission or issue orders relating to any part of the work, or by any such permission given or orders issued, or by failure of the Engineer to give such permission or issue such orders. The Contractor shall bear all losses resulting to him or to the Owner on account of the amount or character of the work, or because nature of the land in or on which the work is done is different from what was estimated or expected, or on account of the weather, elements or other causes. The Contractor shall assume the defense



of all claims or whatsoever character against the Contractor of the Owner, and indemnify, save harmless and insure the Owner, its officers or agents, against all claims arising out of injury or damage to persons, corporation, or property, whether said claims are for unavoidable damage or not, and from all claims relating to labor and materials furnished for the work. The Contractor shall not be required to indemnify the Owner against damage or claims occasioned by acts of the Owner, except otherwise provided in the articles relative to patents and responsibilities.

#### 415.0 DELAY BY OWNER

The Owner may delay the beginning of the work or any part thereof, if the necessary lands or rights-of-way, or materials for such work shall not have been obtained. The Contractor shall have no claim for damages on account of such delay, but shall be entitled to so much additional time wherein to perform and complete this contract on his part as the City shall certify in writing to be just.

#### 416.0 REGISTRATION OF MOTOR VEHICLES

All motor vehicles used in connection with this contract shall be registered in the State of Rhode Island, in accordance with the laws, rules, and regulations thereof, within forty-eight (48) hours of starting work on the contract.

#### 417.0 PROVISIONS REQUIRED BY LAW DEEMED INSERTED

Each and every provision of law and clause required by law to be inserted in this contract shall be deemed to be inserted herein and the contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party, the contract shall forthwith be physically amended to make such insertion.

#### 418.0 SAFETY AND HEALTH REGULATIONS

These construction documents, and the joint and several phases of construction hereby contemplated are to be governed, at all times by applicable provisions of the Federal law(s), including but not limited to, the latest amendments of the following:

- (1) Williams-Steiger Occupational Safety and Health Act of 1970, Public Law 91-596;
- (2) Part 1910 - Occupation Safety and Health Standards, Chapter XVII of Title 29, Code of Federal Regulations;
- (3) Part 1518 - Safety and Health Regulations for Construction, Chapter XIII of Title 29, Code of Federal Regulations.

In the event of any inconsistencies between the above laws and regulations and the provisions of these documents, the laws and regulations shall prevail.

#### 419.0 NOTIFICATION OF EXCAVATION TO UTILITIES

The Contractor shall provide a minimum of two working days notice to "Dig Safe" (1-800-225-4977) and any other appropriate utility before the Contractor begins excavation.

**ANTI-KICKBACK ACKNOWLEDGMENT**

**ALL BIDDERS/OFFERORS MUST ATTEST TO THE FOLLOWING:**

The vendor acknowledges, under the pains and penalties of perjury, that he/she has not been offered, paid, or solicited for any contribution or compensation, nor has he/she been granted a gift, gratuity, or other consideration, either directly or indirectly by any officer, employee or member of the governing body of the City of Pawtucket who exercises any functions or responsibilities in connection with either the award or execution of the project to which this contract pertains.

Further, the vendor acknowledges, under the pains and penalties of perjury, that he/she has not offered, paid, or solicited by way of any contribution or compensation, nor has he/she granted a gift, gratuity or other consideration either directly or indirectly to any officer, employee, or member of the governing body of the City of Pawtucket who exercises any functions or responsibilities in connection with either the award or execution of the project to which this project or contract pertains.

\_\_\_\_\_  
SIGNATURE OF OFFEROR

\_\_\_\_\_  
DATE

\_\_\_\_\_  
TITLE

\_\_\_\_\_  
COMPANY

Title of RFP:

\_\_\_\_\_

# Appendix B

## CITY OF PAWTUCKET GENERAL TERMS AND CONDITIONS OF PURCHASE

### *Preamble*

The City of Pawtucket's Purchasing Office may, from time to time, make amendments to the General Terms and Conditions when the City of Pawtucket's Purchasing Agent determines that such amendments are in the best interest of the City of Pawtucket. Amendments shall be made available for public inspection at the Purchasing Office located in Pawtucket City Hall but shall not require formal public notice and hearing. Copies of the Terms and Conditions shall be provided to any individual or firm requesting them.

### **CITY OF PAWTUCKET'S PURCHASING OFFICE GENERAL CONDITIONS OF PURCHASE**

All City of Pawtucket purchase orders, contracts, solicitations, delivery orders and service requests shall incorporate and be subject to the provisions of Rhode Island General Laws 8-15-4 and the City of Pawtucket purchasing rules and regulations adopted pursuant thereto, all other applicable provisions of the Rhode Island General Laws, the Pawtucket City Charter, specific requirements described in the Request or Contract, and the following General Conditions of Purchase:

1. **GENERAL**

All purchase orders, contracts, solicitations, delivery orders, and service requests are for specified goods and services, in accordance with express terms and conditions of purchase, as defined herein. For the purposes of this document, the terms "bidder" and "contractor" refer to any individual, firm, corporation, or other entity presenting a proposal indicating a desire to enter into contracts with the City of Pawtucket, or with whom a contract is executed by the City of Pawtucket's Purchasing Agent, and the term "contractor" shall have the same meaning as "vendor".

2. **ENTIRE AGREEMENT**

The City of Pawtucket's Purchase Order, or other City of Pawtucket contract endorsed by the City of Pawtucket Purchasing Office, shall constitute the entire and exclusive agreement between the City of Pawtucket and any contractor receiving an award. In the event any conflict between the bidder's standard terms of sale, these conditions or more specific provisions contained in the solicitation shall govern.

All communication between the City of Pawtucket and any contractor pertaining to any award or contract shall be accomplished in writing.

- a. Each proposal will be received with the understanding that the acceptance, in writing, by contract or Purchase Order by the City of Pawtucket Purchasing Agent of the offer to do work or to furnish any or all the materials, equipment, supplies or services described therein shall constitute a contract between the bidder and the City of Pawtucket. This shall bind the bidder on his part to furnish and deliver at the prices and in accordance with the conditions of said accepted proposal and detailed specifications and the City of Pawtucket on its part to order from such contractor (except in case of emergency) and to pay for at the agreed prices, all materials, equipment, supplies or services specified and delivered. A contract shall be deemed executory only to the extent of funds available for payment of the amounts shown on Purchase Orders issued by the City of Pawtucket to the contractors.
- b. No alterations or variations of the terms of the contract shall be valid or binding upon the City of Pawtucket unless submitted in writing and accepted by the City of Pawtucket Purchasing Agent. All orders and changes thereof must emanate from the City of Pawtucket Purchasing Office: no oral agreement or arrangement made by a contractor with a department or employee will be considered to be binding on the City of Pawtucket Purchasing Agent, and may be disregarded.
- c. Contracts will remain in force for the contract period specified or until all articles or services ordered before date of termination shall have been satisfactorily delivered or rendered and accepted and thereafter until all terms and conditions have been met, unless:
  1. terminated prior to expiration date by satisfactory delivery against orders of entire quantities, or
  2. extended upon written authorization of the City of Pawtucket Purchasing Agent and accepted by the contractor, to permit ordering of the unordered balances or

additional quantities at the contract price and in accordance with the contract terms, or

3. canceled by the City of Pawtucket in accordance with other provisions stated herein.
  - d. It is mutually understood and agreed that the contractor shall not assign, transfer, convey, sublet or otherwise dispose of this contract or his right, title or interest therein, or his power to execute such contract, to any other person, company or corporation, without the previous consent, in writing, of the City of Pawtucket Purchasing Agent.
  - e. If, subsequent to the submission of an offer or issuance of a purchase order or execution of a contract, the bidder or contractor shall merge with or be acquired by another entity, the contract may be terminated, except as a corporate resolution prepared by the contractor and the new entity ratifying acceptance of the original bid or contract terms, condition, and pricing is submitted to the City of Pawtucket Purchasing Office, and expressly accepted.
  - f. The contractor or bidder further warrants by submission of an offer or acceptance of a purchase order or other contract that he has no knowledge at the time of such action of any outstanding and delinquent or otherwise unsettled debt owed by him to the City of Pawtucket, and agrees that later discovery by the City of Pawtucket Purchasing Agent that this warranty was given in spite of such knowledge, except where the matter is pending in hearing or from any appeal therefrom, shall form reasonable grounds for termination of the contract.

### 3. SUBCONTRACTS

No subcontracts or collateral agreements shall be permitted, except with the City of Pawtucket's express written consent. Upon request, contractors must submit to the City of Pawtucket Purchasing Office a list of all subcontractors to be employed in the performance of any Purchase Order or other contract arising from this Request.

### 4. RELATIONSHIP OF PARTIES

The contractor or bidder warrants, by submission of an offer or acceptance of a purchase order or other contract, that he is not an employee, agent, or servant of the City of Pawtucket, and that he is fully qualified and capable in all material regards to provide the specified goods and services. Nothing herein shall be construed as creating any contractual relationship or obligation between the City of Pawtucket and any sub-bidder, subcontractor, supplier, or employee of the contractor or offeror.

### 5. COSTS OF PREPARATION

All costs associated with the preparation, development, or submission of bids or other offers will be borne by the offeror. The City of Pawtucket will not reimburse any offeror for such costs.

### 6. SPECIFIED QUANTITY REQUIREMENT

Except where expressly specified to the contrary, all solicitations and contracts are predicated on a specified quantity of goods or services, or for a specified level of funding.

- a. The City of Pawtucket reserves the right to modify the quantity, scope of service, date of delivery or completion, or funding of any contract, with no penalty or charge, by written notice to the contractor, except where alternate terms have been expressly made a part of the contract.
- b. The City of Pawtucket shall not accept quantities in excess of the specified quantity except where the item is normally sold by weight (where sold by weight, the City of Pawtucket will not accept quantities greater than ten per cent [10%] of the specified quantity), or where the Request or Contract provides for awards for other than exact quantities.
- c. Purchase Orders or other contracts may be increased in quantity or extended in term without subsequent solicit with the mutual consent of the contractor and the City of Pawtucket, where determined by the City of Pawtucket Purchasing Agent to be in the City of Pawtucket's best interest.

### 7. TERM AND RENEWAL

Where offers have been requested or contracts awarded for terms exceeding periods of twelve (12) months, it is mutually understood and agreed that the City of Pawtucket's commitment is limited to a base term not to exceed twelve (12) months, subject to renewal annually at the City of Pawtucket's sole option for successive terms as otherwise described, except where expressly specified to the contrary. Purchase orders appearing to commit to obligations of funding or terms of performance may be executed for administrative convenience, but are otherwise subject to this provision, and in such cases the City of Pawtucket's renewal shall be deemed to be automatic, conditional on the continued availability of appropriated funds for the purpose, except as written notice of the City of Pawtucket's intent not to renew is served.

8. DELIVERY/COMPLETION

Delivery must be made as ordered and/or projects completed in accordance with the proposal. If delivery qualifications do not appear on the bidder's proposal, it will be interpreted to mean that goods are in stock and that shipment will be made within seven (7) calendar days. If the project completion date is not specified in the proposal, the date shall be determined by the City of Pawtucket Purchasing Agent. The decision of the City of Pawtucket Purchasing Agent, as to reasonable compliance with the delivery terms, and date of completion shall be final. Burden of proof of delay in receipt of order shall rest with the contractor. No delivery charges shall be added to invoices except when authorized on the Purchase Order.

9. FOREIGN CORPORATIONS

In accordance with Title 7 Chapter 1.1 ("Business Corporations") of the General Laws of Rhode Island, no foreign corporation shall have the right to transact business in this state until it shall have procured a certificate of authority so to do from the Secretary of State.

10. PRICING

All pricing offered or extended to the City of Pawtucket is considered to be firm and fixed unless expressly provided for to the contrary. All prices shall be quoted F.O.B. Destination with freight costs included in the unit cost to be paid by the City of Pawtucket, except, where the Request or Contract permits, offers reflecting F.O.B. Shipping Point will be considered, and freight costs may then be prepaid and added to the invoice.

11. COLLUSION

Bidder or contractor warrants that he has not, directly or indirectly, entered into any agreements or participated in any collusion or otherwise taken any action in restraint of full competitive bidding. In special circumstances, an executed affidavit will be required as a part of the bid.

12. PROHIBITION AGAINST CONTINGENT FEES AND GRATUITIES

Bidder or contractor warrants that he has not paid, and agrees not to pay, any bonus, commission, fee, or gratuity to any employee or official of the City of Pawtucket for the purpose of obtaining any contract or award issued by the City of Pawtucket. Bidder or contractor further warrants that no commission or other payment has been or will be received from or paid to any third party contingent on the award of any contract by the City of Pawtucket, except as shall have been expressly communicated to the City of Pawtucket Purchasing Agent in writing prior to acceptance of the contract or award in question. Subsequent discovery by the City of Pawtucket of non-compliance with these provisions shall constitute sufficient cause for immediate termination of all outstanding contracts and suspension or debarment of the bidder(s) or contractor(s) involved.

13. AWARDS

Awards will be made with reasonable promptness and by written notice to the successful bidder (only); bids are considered to be irrevocable for a period of ninety (90) days following the bid opening unless expressly provided for to the contrary in the Request, and may not be withdrawn during this period without the express permission of the City of Pawtucket Purchasing Agent.

- a. Awards shall be made to the bidder(s) whose offer(s) constitutes the lowest responsive price offer (or lowest responsive price offer on an evaluated basis) for the item(s) in question or for the Request as a whole, at the option of the City of Pawtucket. The City of Pawtucket reserves the right to determine those offers which are responsive to the Request, or which otherwise serve its best interests.
- b. The City of Pawtucket reserves the right, before making award, to initiate investigations as to whether or not the materials, equipment, supplies, qualifications or facilities offered by

the bidder meet the requirements set forth in the proposal and specification, and are ample and sufficient to insure the proper performance of the contract in the event of award. If upon such examination it is found that the conditions of the proposal are not complied with or that articles or equipment proposed to be furnished do not meet the requirements called for, or that the qualifications or facilities are not satisfactory, the City of Pawtucket may reject such a bid. It is distinctly understood, however, that nothing in the foregoing shall mean or imply that it is obligatory upon the City of Pawtucket to make any examinations before awarding a contract; and it is further understood that if such examination is made, it in no way relieves the contractor from fulfilling all requirements and conditions of the contract.

- c. Qualified or conditional offers which impose limitations of the bidder's liability or modify the requirements of the bid, offers for alternate specifications, or which are made subject to different terms and conditions than those specified by the City of Pawtucket may, at the option of the City of Pawtucket, be
  - 1. rejected as being non-responsive, or
  - 2. set aside in favor of the City of Pawtucket's terms and conditions (with the consent of the bidder), or
  - 3. accepted, where the City of Pawtucket Purchasing Agent determines that such acceptance best serves the interests of the City of Pawtucket.Acceptance or rejection of alternate or counter-offers by the City of Pawtucket shall not constitute a precedent which shall be considered to be binding on successive solicitations or procurements.
- d. Bids submitted in pencil, or which do not bear an original signature, in ink, by an owner or authorized agent thereof, will not be accepted.
- e. Bids must be extended in the unit of measure specified in the Request. In the event of any discrepancy between unit prices and their extensions, the unit price will govern.
- f. The City of Pawtucket Purchasing Agent reserves the right to determine the responsibility of any bidder for a particular procurement.
- g. The City of Pawtucket Purchasing Agent reserves the right to reject any and all bids in whole or in part, to waive technical defects, irregularities, and omissions, and to give consideration to past performance of the offerors where, in his judgment the best interests of the City of Pawtucket will be served by so doing.
- h. The City of Pawtucket Purchasing Agent reserves the right to make awards by items, group of items or on the total low bid for all the items specified as indicated in the detailed specification, unless the bidder specifically indicates otherwise in his bid.
- i. Preference may be given to bids on products raised or manufactured in the City of Pawtucket or State of Rhode Island, other things being equal.
- j. The impact of discounted payment terms shall not be considered in evaluating responses to any Request.
- k. The City of Pawtucket Purchasing Agent reserves the right to act in the City of Pawtucket's best interests regarding awards caused by clerical errors by the City of Pawtucket Purchasing Office.

#### 14. SUSPENSION AND DEBARMENT

The City of Pawtucket Purchasing Agent may suspend or debar any vendor or potential bidder, for good cause shown:

- a. A debarment or suspension against a part of a corporate entity constitutes debarment or suspension of all of its divisions and all other organizational elements, except where the action has been specifically limited in scope and application, and may include all known corporate affiliates of a contractor, when such offense or act occurred in connection with the affiliate's performance of duties for or on behalf of the contractor, or with the knowledge, approval, or acquiescence of the contractor or one or more of its principals or directors (or where the contractor otherwise participated in, knew of, or had reason to know of the acts).
- b. The fraudulent, criminal or other serious improper conduct of any officer, director, shareholder, partner, employee, or any other individual associated with a contractor may be imputed to the contractor when the conduct occurred in connection with the individual's performance of duties for or on behalf of the contractor, or with the contractor's knowledge, approval or acquiescence. The contractor's acceptance of benefits derived from the conduct shall be evidence of such knowledge, approval, or acquiescence.

- c. A vendor or contractor who knowingly engages as a subcontractor for a contract awarded by the City of Pawtucket to a vendor or contractor then under a ruling of suspension or debarment by the City of Pawtucket shall be subject to disallowance of cost, annulment or termination of award, issuance of a stop work order, or debarment or suspension, as may be judged to be appropriate by the City of Pawtucket's Purchasing Agent.

15. PUBLIC RECORDS

Contractors and bidders are advised that certain documents, correspondence, and other submissions to the City of Pawtucket's Purchasing Office may be voluntarily made public by the City of Pawtucket absent specific notice that portions of such submittals may contain confidential or proprietary information, such that public access to those items should be withheld.

16. PRODUCT EVALUATION

In all specifications, the words "or equal" are understood after each article when manufacturer's name or catalog are referenced. If bidding on items other than those specified, the bidder must, in every instance, give the trade designation of the article, manufacturer's name and detailed specifications of the item the bidder proposes to furnish; otherwise, the bid will be construed as submitted on the identical commodity described in the detailed specifications. The City of Pawtucket's Purchasing Agent reserves the right to determine whether or not the item submitted is the approved equal the detailed specifications.

- a. Any objections to specifications must be filed by a bidder, in writing, with the City of Pawtucket's Purchasing Agent at least 96 hours before the time of bid opening to enable the City of Pawtucket's Purchasing Office to properly investigate the objections.
- b. All standards are minimum standards except as otherwise provided for in the Request or Contract.
- c. Samples must be submitted to the City of Pawtucket's Purchasing Office in accordance with the terms of the proposals and detailed specifications. Samples must be furnished free of charge and must be accompanied by descriptive memorandum invoices indicating whether or not the bidder desires their return and specifying the address to which they are to be returned (at the bidder's risk and expense), provided they have not been used or made useless by tests; and absent instructions, the samples shall be considered to be abandoned. Award samples may be held for comparison with deliveries.
- d. All samples submitted are subject to test by any laboratory the City of Pawtucket's Purchasing Agent may designate.

17. PRODUCT ACCEPTANCE

All merchandise offered or otherwise provided shall be new, of prime manufacture, and of first quality unless otherwise specified by the City of Pawtucket. The City of Pawtucket reserves the right to reject all nonconforming goods, and to cause their return for credit or replacement, at the City of Pawtucket's option. Contract deliverables specified for procurements of services shall be construed to be work products, and subject to the provisions of this section.

- a. Failure by the City of Pawtucket to discover latent defect(s) or concealed damage or non-conformance shall not foreclose the City of Pawtucket's right to subsequently reject the goods in question.
- b. Formal or informal acceptance by the City of Pawtucket of non-conforming goods shall not constitute a precedent for successive receipts or procurements.
- c. Where the contractor fails to promptly cure the defect or replace the goods, the City of Pawtucket reserves the right to cancel the Purchase Order, contract with a different contractor, and to invoice the original contractor for any differential in price over the original contract price.
- d. When materials, equipment or supplies are rejected, the same must be removed by the contractor from the premises of the City of Pawtucket within forty-eight (48) hours of notification. Rejected items left longer than two days will be regarded as abandoned and the City of Pawtucket shall have the right to dispose of them as its own property.

18. PRODUCT WARRANTIES

All product or service warranties normally offered by the contractor or bidder shall accrue to the City of Pawtucket's benefit, in addition to any special requirements which may be imposed by the City of Pawtucket. Every unit delivered must be guaranteed against faulty material and

workmanship for a period of one year unless otherwise specified, and the City of Pawtucket may, in the event of failure, order its replacement, repair, or return for full credit, at its sole option.

19. PAYMENT

Unless otherwise provided for by the Request or Contract, payment shall not be made until delivery has been made, or services performed, in full, and accepted. Payment shall not be due prior to thirty (30) working days following the latest of completion, acceptance, or the rendering of a properly submitted invoice.

- a. Payment terms other than the foregoing may be rejected as being nonresponsive.
- b. No partial shipments, or partial completion will be accepted, unless provided for by the Request or Contract.
- c. Where a question of quality is involved, or failure to complete a project by the specified due date, payment in whole or part against which to charge back any adjustment required, shall be withheld at the direction of the City of Pawtucket Purchasing Agent. In the event a cash discount is stipulated, the withholding of payments, as herein described, will not deprive the City of Pawtucket from taking such discount.
- d. Payments for used portion of inferior delivery or late delivery will be made by the City of Pawtucket on an adjusted price basis.
- e. Payments on contracts under architectural or engineering supervision must be accompanied by a Certificate of Payment and Statement of Account signed by the architect or engineer and submitted to the City of Pawtucket Purchasing Office for approval.

20. THIRD PARTY PAYMENTS

The City of Pawtucket recognizes no assigned or collateral rights to any purchase agreement except as may be expressly provided for in the bid or contract documents, and will not accede to any request for third party or joint payment(s), except as provided for in specific orders by a court of competent jurisdiction, or by express written permission of the City of Pawtucket's Purchasing Agent. Where an offer is contingent upon such payment(s), the offeror is obligated to serve affirmative notice in his bid submission.

21. SET-OFF AGAINST PAYMENTS

Payments due the contractor may be subject to reduction equal to the amount of unpaid and delinquent state taxes (or other just debt owed to the State), except where notice of delinquency has not been served or while the matter is pending in hearing or from any appeal therefrom.

22. CLAIMS

Any claim against a contractor may be deducted by the City of Pawtucket from any money due him in the same or other transactions. If no deduction is made in such fashion, the contractor shall pay the City of Pawtucket the amount of such claim on demand. Submission of a voucher and payment, thereof, by the City of Pawtucket shall not preclude the City of Pawtucket's Purchasing Agent from demanding a price adjustment in any case when the commodity delivered is later found to deviate from the specifications and proposal.

- a. The City of Pawtucket's Purchasing Agent may assess dollar damages against a vendor or contractor determined to be non-performing or otherwise in default of their contractual obligations equal to the cost of remedy incurred by the City of Pawtucket, and make payment of such damages a condition for consideration for any subsequent award. Failure by the vendor or contractor to pay such damages shall constitute just cause for disqualification and rejection, suspension, or debarment.

23. CERTIFICATION OF FUNDING

The Director of Finance shall provide certification as to the availability of funds to support the procurement for the current fiscal year ending June 30th only. Where delivery or service requirements extend beyond the end of the current fiscal year, such extensions are subject to both the availability of appropriated funds and a determination of continued need.

24. UNUSED BALANCES

Unless otherwise specified, all unused Blanket Order quantities and/or unexpended funds shall be automatically canceled on the expiration of the specified term. Similarly, for orders encompassing



more than one fiscal year, unexpended balances of funding allotted for an individual fiscal year may be liquidated at the close of that fiscal year, at the City of Pawtucket's sole option.

25. **MINORITY BUSINESS ENTERPRISES**

Pursuant to the provisions of Title 37 Chapter 14.1 of the General Laws, the City of Pawtucket reserves the right to apply additional consideration to offers, and to direct awards to bidders other than the responsive bid representing the lowest price where:

- a. the offer is fully responsive to the terms and conditions of the Request, and
- b. the price offer is determined to be within a competitive range (not to exceed 5% higher than the lowest responsive price offer) for the product or service, and
- c. the firm making the offer has been certified by the R.I. Department of Economic Development to be a small business concern meeting the criteria established to be considered a Minority Business Enterprise.

26. **PREVAILING WAGE REQUIREMENT**

In accordance with Title 37 Chapter 13 of the General Laws of Rhode Island, payment of the general prevailing rate of per diem wages and the general prevailing rate for regular, overtime and other working conditions existing in the locality for each craft, mechanic, teamster, or type of workman needed to execute this work is a requirement for both contractors and subcontractors for all public works projects.

The rates of pay set forth under this contract, are the minimum to be paid during the life of the Contract. It is therefore, the responsibility of Bidders to inform themselves as to local labor conditions, such as the length of work day and work week, overtime compensation, health and welfare contributions, labor supply and prospective changes or adjustments of rates.

Certified weekly payrolls and statement of compliance forms are required from contractors and subcontractors. Submit on State of Rhode Island Department of Labor and Training forms.

27. **EQUAL OPPORTUNITY COMPLIANCE, HANDICAPPED ACCESS AND AFFIRMATIVE ACTION**

Contractors of the City of Pawtucket are required to demonstrate the same commitment to equal opportunity as prevails under federal contracts controlled by Federal Executive Orders 11246, 11625, 11375 and 11830, and Title 28 Chapter 5.1 of the General Laws of Rhode Island.

Affirmative action plans shall be submitted by the contractor for review by the State Equal Opportunity Office. A contractor's failure to abide by the rules, regulations, contract terms and compliance reporting provisions as established shall be grounds for forfeiture and penalties as shall be established, including but not limited to suspension.

28. **DRUG-FREE WORKPLACE REQUIREMENT**

Contractors who do business with the City of Pawtucket and their employees shall abide by the State's drug-free workplace policy and the contractor shall so attest by signing a certificate of compliance.

29. **TAXES**

The City of Pawtucket is exempt from payment of excise, transportation and sales tax imposed by the Federal or State Government. These taxes should not be included in the proposal price. Exemption Certificates will be furnished upon request.

30. **INSURANCE**

All construction contractors, independent tradesmen, or firms providing any type of maintenance, repair, or other type of service to be performed on City of Pawtucket premises, buildings, or grounds are required to purchase and maintain coverage with a company or companies licensed to do business in the state as follows:

- a. **Comprehensive General Liability Insurance**  
Combined Single Limit not less than \$1,000,000 each occurrence for bodily Injury and property damage.
  - Independent Contractors;
  - Contractual - including construction hold harmless and other types of contracts or agreements in effect for insured operations;

- Products and Completed Operations;
  - Personal Injury (with employee exclusion deleted)
- b. Automobile Liability Insurance  
Combined Single Limit not less than \$1,000,000 each occurrence for bodily Injury and property damage including non-owned and/or hired vehicle coverage.

OR

Bodily Injury, per person, \$500,000/ Bodily Injury, \$1,000,000 per accident/  
Property Damage, \$500,000 per accident including non-owned and/or hired  
vehicle coverage.

- c. Workers' Compensation Insurance  
As required by the General Laws of Rhode Island.
- Employers liability \$500,000

The City of Pawtucket shall be named as an additional insured on the vendor's Comprehensive General Liability Policy and Automobile Liability Policy.

The City of Pawtucket's Purchasing Agent reserves the right to consider and accept alternate forms and plans of insurance or to require additional or more extensive coverage for any individual requirement. Successful bidders shall provide certificates of coverage, reflecting the City of Pawtucket as an additional insured, to the City of Pawtucket Purchasing Office, forty-eight (48) hours prior to the commencement of work, as a condition of award. Failure to comply with this provision shall result in rejection of the offeror's bid.

31. **BID SURETY**

When requested, a bidder must furnish a Bid Bond or Certified Check for 5% of his bid, or for the stated amount shown in the solicitation. Bid Bonds must be executed by a reliable Surety Company authorized to do business in the State of Rhode Island. Failure to provide Bid Surety with bid may be cause for rejection of bid. The Bid Surety of any three bidders in contention will be held until an award has been made according to the specifications of each proposal. All others will be returned by mail within 48 hours following the bid opening. Upon award of a contract, the remaining sureties will be returned by mail unless instructed to do otherwise.

32. **PERFORMANCE AND LABOR AND PAYMENT BONDS**

A performance bond and labor and payment bond of up to 100% of an award may be required by the City of Pawtucket's Purchasing Agent. Bonds must meet the following requirements:

- a. Corporation: The Bond must be signed by an official of the corporation above his/her official title and the corporate seal must be affixed over his/her signature.
- b. Firm or Partnership: The Bond must be signed by all of the partners and must indicate that they are " Doing Business As (name of firm)."
- c. Individual: The Bond must be signed by the individual owning the business and indicate "Owner."
- d. The Surety Company executing the Bond must be licensed to do business in the State of Rhode Island or Bond must be countersigned by a company so licensed.
- e. The Bond must be signed by an official of the Surety Company and the corporate seal must be affixed over his signature.
- f. Signatures of two witnesses for both the principal and the Surety must appear on the Bond.
- g. A Power of Attorney for the official signing of the Bond for the Surety Company must be submitted with the Bond.

33. **SUSPENSION, DEFAULT AND TERMINATION**

a. Suspension of a Contract by the City of Pawtucket  
The City of Pawtucket reserves the right at any time and for any reason to suspend all or part of this contract, for a reasonable period, not to exceed sixty days, unless the parties agree to a longer period. The City of Pawtucket shall provide the contractor with written notice of the suspension order signed by the Purchasing Agent or his or her designee, which shall set forth the date upon

which the suspension shall take effect, the date of its expiration, and all applicable instructions. Upon receipt of said order, the contractor shall immediately comply with the order and suspend all work under this contract as specified in the order. The contractor shall take all reasonable steps to mitigate costs and adverse impact to the work specified in the contract during the suspension period. Before the order expires, the City of Pawtucket shall either:

1. cancel the suspension order;
2. extend the suspension order for a specified time period not to exceed thirty (30) days; or
3. terminate the contract as provided herein.

The contractor shall resume performance once a suspension order issued under this section is canceled or expires. If as a result of the suspension of performance, there is a financial or schedule impact upon the contract, an appropriate adjustment may be made by, or with the approval of, the City of Pawtucket's Purchasing Agent. Any adjustment shall be set forth in writing. After a suspension order has been canceled or expires, the contractor shall provide any request for adjustment to the City of Pawtucket's Purchasing Agent within thirty (30) days after resuming work performance.

b. Termination of a Contract by the City of Pawtucket

1. Termination for Default or Nonperformance

If, for any reason, the contractor breaches the contract by failing to satisfactorily fulfill or perform any obligations, promises, terms, or conditions, and having been given reasonable notice of and opportunity to cure such default, fails to take satisfactory corrective action within the time specified by the City of Pawtucket, the City of Pawtucket may terminate the contract, in whole or in part, the termination of all outstanding contracts or sub-contracts held by the contractor, and the suspension or debarment of the contractor from future procurements by giving written notice to the contractor specifying the date for termination. The City of Pawtucket shall endeavor to provide such notice at least seven (7) calendar days before the effective date of the termination.

A contractor who fails to commence within the time specified or complete an award made for repairs, alterations, construction, or any other service will be considered in default of contract. If contractor consistently fails to deliver quantities or otherwise perform as specified, the City of Pawtucket's Purchasing Agent reserves the right to terminate the contract and contract for completion of the work with another contractor and seek recourse from the defaulting contractor or his surety. In the event of a termination for default or nonperformance, in whole or in part, the City of Pawtucket may procure similar goods or services in a manner and upon terms it deems appropriate, and the contractor shall be liable for the excess costs incurred by the City of Pawtucket as a result of the contractor's default. The contractor, or its surety, agrees to promptly reimburse the City of Pawtucket for the excess costs, but shall have no claim to the difference should the replacement cost be less.

2. Termination Without Cause

The City of Pawtucket may terminate the contract in whole or in part without cause at any time by giving written notice to the contractor of such termination at least thirty (30) days before the effective date of such termination. The notice shall specify the part(s) of the contract being terminated and the effective termination date.

Within thirty (30) days of the effective date of the termination of the contract the contractor shall compile and submit to the City of Pawtucket an accounting of the work performed up to the date of termination. The City of Pawtucket may consider the following claims in determining reasonable compensation owed to the contractor for work performed up to the date of termination:

- a. contract prices for goods or services accepted under the contract;
- b. costs incurred in preparing to perform and performing the terminated portion of the contract; or

- c. any other reasonable costs incurred by the contractor as a result of the termination.

The total sum to be paid to the contractor shall not exceed the total contract price, less any payments previously made to the contractor, the proceeds from any sales of goods or manufacturing materials, and the contract price for work not terminated.

3. Contractor's Obligations in the Event of Termination

If the contract is terminated for any reason, or expires pursuant to its terms, the contractor shall transfer and deliver to the City of Pawtucket in the manner and to the extent directed by the City of Pawtucket:

- a. all finished or unfinished material prepared by the contractor; and
- b. all material, if any, provided to the contractor by the City of Pawtucket.

For the purposes of the contract, "material" shall include, but is not limited to, goods, supplies, parts, tools, machinery, equipment, furniture, fixtures, information, data, reports, summaries, tables, maps, charts, photographs, studies, recommendations, files, audiotapes, videotapes, records, keys, security badges, and documents.

If the contract is terminated for cause, the contractor shall not be relieved of liability to the City of Pawtucket for damages sustained because of any breach by the contractor. In such event, the City of Pawtucket may retain any amounts which may be due and owing to the contractor until such time as the exact amount of damages due the City of Pawtucket from the contractor has been determined by the City of Pawtucket Purchasing Agent. The City of Pawtucket may also set off any damages so determined against the amounts retained.

Upon termination of the contract, the contractor shall stop performance on the date specified, terminate any outstanding orders and subcontracts applicable to the terminated portion of the contract, and shall incur no further commitments or obligations in connection with the terminated performance. The contractor shall settle all liabilities and claims arising out of the termination of subcontracts and order generating from the terminated performance. The City of Pawtucket may direct the contractor to assign the contractor's right, title and interest under terminated orders or subcontracts to the City of Pawtucket or a third party.

Terminations of Purchase Order Contracts or Master Pricing Agreements shall require the signature of the City of Pawtucket Purchasing Agent or his designee. Notice of termination by either party shall be submitted in writing to the other party in accordance with the termination clause of the contract, or where no specific termination clause is included, written notice shall be provided no later than thirty (30) days before the expiration of the contract.

34. INDEMNITY

The contractor guarantees:

- a. To save the City of Pawtucket, its agents and employees, harmless from any liability imposed upon the City of Pawtucket arising from the negligence, either active or passive, of the contractor, as well as for the use of any copyrighted or uncopyrighted composition, secret process, patented or unpatented invention, article or appliance furnished or used in the performance of the contract of which the contractor is not the patentee, assignee or licensee.
- b. To pay for all permits, licenses and fees and give all notices and comply with all laws, ordinances, rules and regulations of the City of Pawtucket and of the State of Rhode Island.
- c. That the equipment offered is standard new equipment, latest model of regular stock product with all parts regularly used with the type of equipment offered; also, that no attachment or part has been substituted or applied contrary to manufacturer's recommendations and standard practice.

35. CONTRACTOR'S OBLIGATIONS

In addition to the specific requirements of the contract, construction and building repair contractors bear the following standard responsibilities:

- a. To furnish adequate protection from damage for all work and to repair damages of any kind, for which he or his workmen are responsible, to the building or equipment, to his own work, or to the work of other contractors;
- b. The contractor, its subcontractor(s) and their employees and/or agents, shall protect and preserve property in the contractor or subcontractor's possessions in which the City of Pawtucket has an interest, and any and all materials provided to the contractor or subcontractor by the City of Pawtucket;
- c. To clear and remove all debris and rubbish resulting from his work from time to time, as directed or required, a completion of the work leave the premises in a neat unobstructed condition, broom clean, and in satisfactory order and repair;
- d. To store equipment, supplies, and material at the site only upon approval by the City of Pawtucket, and at his own risk;
- e. To perform all work so as to cause the least inconvenience to the City of Pawtucket, and with proper consideration for the rights of other contractors and workmen;
- f. To acquaint themselves with conditions to be found at the site, and to assume responsibility for the appropriate dispatching of equipment and supervision of his employees during the conduct of the work;
- g. To ensure that his employees are instructed with respect to special regulations, policies, and procedures in effect for any City of Pawtucket facility or site, and that they comply with such rules, including but not limited to security policies or practices and/or criminal background checks for any employees and/or subcontractors;
- h. The contractor shall ensure that its employees or agents are experienced and fully qualified to engage in the activities and services required under the contract;
- i. The contractor shall ensure that at all times while services are being performed under this contract at least one of its employees or agents on the premises has a good command of the English language and can effectively communicate with the City of Pawtucket and its staff;
- j. The contractor and contractor's employees or agents shall comply with all applicable licensing and operating requirements required by federal or state law and shall meet accreditation and other generally accepted standards of quality in the applicable field of activity;
- k. The contractor shall secure and retain all employee-related insurance coverage for its employees and agents as required by law; and
- l. The contractor, subcontractor, and his or her employees and agents shall not disclose any confidential information of the City of Pawtucket to a third party. Confidential information means:
  - (1) any information of a sensitive or proprietary nature, whether or not specially identified as confidential or proprietary; or
  - (2) any information about the City of Pawtucket gained during the performance of a contract that is not already lawfully in the public domain.

36. **FORCE MAJEURE**

All orders shall be filled by the contractor with reasonable promptness, but the contractor shall not be held responsible for any losses resulting if the fulfillment of the terms of the contract shall be delayed or prevented by wars, acts of public enemies, strikes, fires, floods, acts of God, or for any other acts not within the control of the contractor and which by the exercise of reasonable diligence, the contractor is unable to prevent.

## **Appendix C**

### **General Wage Rate Decision Davis Bacon**

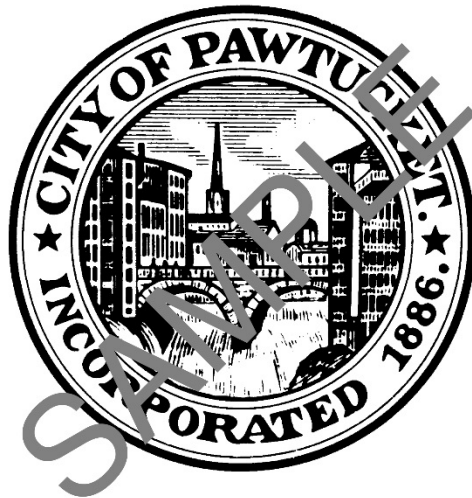
The current wage determination (Heavy Construction, Providence County), as obtained from the Rhode Island Department of Labor and Training, is bound as part of this Project Manual.

**Appendix D**

**City of Pawtucket Standard Form of Agreement (Sample)**

**CONTRACT AGREEMENT  
FOR:**

**PROJECT\_TITLE**



**PAWTUCKET, RHODE ISLAND**

PURCHASING DIVISION  
137 ROOSEVELT AVE.  
PAWTUCKET, RHODE ISLAND

MM/DD/YYYY



**CONTRACT AGREEMENT**

**PROJECT\_TITLE**

Pawtucket, Rhode Island

**1. AGREEMENT FOR SERVICES**

This Agreement for Services (hereinafter the "Agreement" or "Contract") made this ##th day of #####, 2015 between the City of Pawtucket, a municipal corporation of the State of Rhode Island, with a business address of 137 Roosevelt Avenue, Pawtucket, Rhode Island (hereinafter the "City") and VENDOR, a company authorized to do business in the State of Rhode Island, with a business address of ##### (hereinafter the "Consultant").

**2. SCOPE OF CONSULTANT SERVICES**

This is a contract to provide the City with consulting services as specified herein and as set forth in the following Exhibits, all of which are attached hereto and incorporated into this Agreement by reference herein:

- Exhibit 1 – RFP #####;
- Exhibit 2 – Rhode Island Department of Labor and Training Municipal Contract Addendum;

and all addenda issued and any resulting negotiations, and the RFP response received by the City from the Consultant.

**3. COMPENSATION FOR SERVICES**

The City shall pay the Consultant in the following sums for work performed under this Agreement after the effective date as set out below:

\$,#####

The payment and performance of any obligations under this contract for years beyond the first fiscal year are subject to the availability of funds. Payment will not be made until services have been fully performed and accepted, and upon a properly submitted invoice. All invoices must clearly display the purchase order number.

**4. RHODE ISLAND LAW AND FORUM**

(a) This Agreement shall be construed according to the law of the State of Rhode Island.

(b) Any litigation between the City and the Consultant arising under this Agreement or out of work performed under this Agreement shall occur, if in the state courts, in the Providence County Superior Court, and in the federal courts, in the United States District Court for the District of Rhode Island.

**5. NOTICE**

Any notice provided for under this Agreement shall be sufficient if in writing and delivered personally to the following addressee or deposited in the United States mail, postage prepaid, certified mail, return receipt requested, addressed as follows, or to such other address as the receiving party hereafter shall specify in writing:

If to the City:

Andrew Silvia, PE, Chief of Project Development  
250 Armistice Boulevard  
Pawtucket, RI 02860

If to the Consultant:

#####

**6. COMPLIANCE WITH LAWS**

Consultant shall materially comply with any and all Federal, state and local laws and regulations now in force and which may hereafter during the term of this contract, be enacted and become effected which are applicable, as well as obtaining any and all required permits and licenses.

**7. TIMEFRAME TO COMPLETE**

The Consultant shall complete the consulting services located in the City of Pawtucket, Rhode Island no later than #####.

**8. WAIVERS**

No waiver of any breach or any one or more of the conditions or covenants of this Contract by City or Consultant shall be deemed to imply or to constitute a waiver of any prior or succeeding breach; and the failure of City or Consultant to insist upon the strict performance of the terms, covenants, agreements and conditions herein contained or any one of them shall not constitute or be construed as a waiver or relinquishment of City's or Consultant's right to thereafter enforce any such default, or any term, covenants, agreement or condition.

**CONSULTANT (VENDOR)**

\_\_\_\_\_  
WITNESS

Subscribed and sworn to before me in the \_\_\_\_\_

on this \_\_\_\_\_ day of \_\_\_\_\_, 2015.

\_\_\_\_\_  
NOTARY PUBLIC  
My Commission Expires:

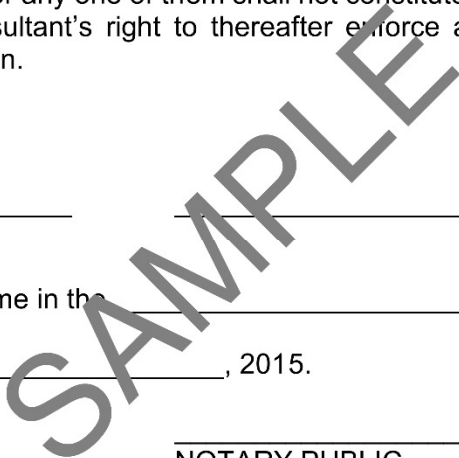
**CITY OF PAWTUCKET**

\_\_\_\_\_  
WITNESS

Subscribed and sworn to before me in the \_\_\_\_\_

on this \_\_\_\_\_ day of \_\_\_\_\_, 2015.

\_\_\_\_\_  
NOTARY PUBLIC  
My Commission Expires:



**EXHIBIT 1:**

**RFP #####**

**SAMPLE**

**EXHIBIT 2:**

**RHODE ISLAND DLT MUNICIPAL CONTRACT ADDENDUM**

**SAMPLE**

**MUNICIPAL CONTRACT ADDENDUM**  
**RHODE ISLAND DEPARTMENT OF LABOR AND TRAINING**  
**PREVAILING WAGE REQUIREMENTS**  
**(37-13-1 ET SEQ.)**

The prevailing wage requirements are generally set forth in RIGL 37-13-1 et seq. These requirements refer to the prevailing rate of pay for regular, holiday, and overtime wages to be paid to each craftsmen, mechanic, teamster, laborer, or other type of worker performing work on public works projects when state or municipal funds exceed one thousand dollars (\$1,000).

All Prevailing Wage Contractors and Subcontractors are required to:

1. Submit to the Awarding Authority a list of the contractor's subcontractors for any part or all of the prevailing wage work in accordance with RIGL § 37-13-4;
2. Pay all prevailing wage employees at least once per week and in accordance with RIGL §37-13-7 (see Appendix B attached);
3. Post the prevailing wage rate scale and the Department of Labor and Training's prevailing wage poster in a prominent and easily accessible place on the work site in accordance with RIGL §37-13-11; posters may be downloaded at [www.dlt.ri.gov/pw/Posters.htm](http://www.dlt.ri.gov/pw/Posters.htm), [www.dlt.ri.gov/pw/poster/htm](http://www.dlt.ri.gov/pw/poster/htm) or obtained from the Department of Labor and Training, Center General Complex, 1511 Pontiac Avenue, Cranston, Rhode Island;
4. Access the Department of Labor and Training website, at [www.dlt.ri.gov](http://www.dlt.ri.gov) on or before July 1<sup>st</sup> of each year, until such time as the contract is completed, to ascertain the current prevailing wage rates and the amount of payment or contributions for each covered prevailing wage employee and make any necessary adjustments to the covered employee's prevailing wage rates effective July 1<sup>st</sup> of each year in compliance with RIGL §37-13-8;
5. Attach a copy of this CONTRACT ADDENDUM and its attachments as a binding obligation to any and all contracts between the contractor and any subcontractors and their assignees for prevailing wage work performed pursuant to this contract;
6. Provide for the payment of overtime for prevailing wage employees who work in excess of eight (8) hours in any one day or forty (40) hours in any one week as provided by RIGL §37-13-10;

7. Maintain accurate prevailing wage employee payroll records on a Rhode Island Certified Weekly Payroll form available for download at [www.dlt.ri.gov/pw.forms/htm](http://www.dlt.ri.gov/pw.forms/htm), as required by RIGL §37-13-13, and make those records available to the Department of Labor and Training upon request;
8. Furnish the fully executed RI Certified Weekly Payroll Form to the awarding authority on a monthly basis for all work completed in the preceding month.
9. For general or primary contracts one million dollars (\$1,000,000) or more, shall maintain on the work site a fully executed RI Certified Prevailing Wage Daily Log listing the contractor's employees employed each day on the public works site; the RI Certified Prevailing Wage Daily Log shall be available for inspection on the public works site at all times; this rule shall not apply to road, highway, or bridge public works projects. Where applicable, furnish both the Rhode Island Certified Prevailing Wage Daily Log together with the Rhode Island Weekly Certified Payroll to the awarding authority.
10. Assure that all covered prevailing wage employees on construction projects with a total project cost of one hundred thousand dollars (\$100,000) or more has a OSHA ten (10) hour construction safety certification in compliance with RIGL § 37-23-1;
11. Assure that all prevailing wage employees who perform work which requires a Rhode Island trade license possess the appropriate Rhode Island trade license in compliance with Rhode Island law; and
12. Comply with all applicable provisions of RIGL §37-13-1, et. seq;

Any questions or concerns regarding this CONTRACT ADDENDUM should be addressed to the contractor or subcontractor's attorney. Additional Prevailing Wage information may be obtained from the Department of Labor and Training at [www.dlt.ri.gov/pw](http://www.dlt.ri.gov/pw).

### **CERTIFICATION**

I hereby certify that I have reviewed this CONTRACT ADDENDUM and understand my obligations as stated above.

By: \_\_\_\_\_

Title: \_\_\_\_\_

Subscribed and sworn before me this \_\_\_\_ day of \_\_\_\_\_, 20\_\_.

\_\_\_\_\_  
Notary Public  
My commission expires: \_\_\_\_\_

SAMPLE

APPENDIX A

**TITLE 37**  
**Public Property and Works**

**CHAPTER 37-13**  
**Labor and Payment of Debts by Contractors**

**SECTION 37-13-5**

**§ 37-13-5 Payment for trucking or materials furnished – Withholding of sums due.** – A contractor or subcontractor on public works authorized by a proper authority shall pay any obligation or charge for trucking and material which have been furnished for the use of the contractor or subcontractor, in connection with the public works being performed by him or her, within ninety (90) days after the obligation or charge is incurred or the trucking service has been performed or the material has been delivered to the site of the work, whichever is later. When it is brought to the notice of the proper authority in a city or town, or the proper authority in the state having supervision of the contract, that the obligation or charge has not been paid by the contractor or subcontractor, the proper authority may deduct and hold for a period not exceeding sixty (60) days, from sums of money due to the contractor or subcontractor, the equivalent amount of such sums certified by a trucker or materialman creditor as due him or her, as provided in this section, and which the proper authority determines is reasonable for trucking performed or materials furnished for the public works.



APPENDIX B

**TITLE 37**

**Public Property and Works**

**CHAPTER 37-13**

**Labor and Payment of Debts by Contractors**

**SECTION 37-13-7**

**§ 37-13-7 Specification in contract of amount and frequency of payment of wages.**

– (a) Every call for bids for every contract in excess of one thousand dollars (\$1,000), to which the state of Rhode Island or any political subdivision thereof or any public agency or quasi-public agency is a party, for construction, alteration, and/or repair, including painting and decorating, of public buildings or public works of the state of Rhode Island or any political subdivision thereof, or any public agency or quasi-public agency and which requires or involves the employment of employees, shall contain a provision stating the minimum wages to be paid various types of employees which shall be based upon the wages that will be determined by the director of labor and training to be prevailing for the corresponding types of employees employed on projects of a character similar to the contract work in the city, town, village, or other appropriate political subdivision of the state of Rhode Island in which the work is to be performed. Every contract shall contain a stipulation that the contractor or his or her subcontractor shall pay all the employees employed directly upon the site of the work, unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account, the full amounts accrued at time of payment computed at wage rates not less than those stated in the call for bids, regardless of any contractual relationships which may be alleged to exist between the contractor or subcontractor and the employees, and that the scale of wages to be paid shall be posted by the contractor in a prominent and easily accessible place at the site of the work; and the further stipulation that there may be withheld from the contractor so much of the accrued payments as may be considered necessary to pay to the employees employed by the contractor, or any subcontractor on the work, the difference between the rates of wages required by the contract to be paid the employees on the work and the rates of wages received by the employees and not refunded to the contractor, subcontractors, or their agents.

(b) The terms "wages", "scale of wages", "wage rates", "minimum wages", and "prevailing wages" shall include:

- (1) The basic hourly rate of pay; and
- (2) The amount of:

(A) The rate of contribution made by a contractor or subcontractor to a trustee or to a third person pursuant to a fund, plan, or program; and

(B) The rate of costs to the contractor or subcontractor which may be reasonably anticipated in providing benefits to employees pursuant to an enforceable commitment to carry out a financially responsible plan or program which was communicated in writing to the employees affected, for medical or hospital care, pensions on retirement or death, compensation for injuries or illness resulting from occupational activity, or insurance to provide any of the foregoing, for unemployment benefits, life insurance, disability and sickness insurance, or accident insurance, for vacation and holiday pay, for defraying costs of apprenticeship or other similar programs, or for other bona fide fringe benefits, but only where the contractor or subcontractor is not required by other federal, state, or local law to provide any of the benefits; provided, that the obligation of a contractor or subcontractor to make payment in accordance with the prevailing wage determinations of the director of labor and training insofar as this chapter of this title and other acts incorporating this chapter of this title by reference are concerned may be discharged by the making of payments in cash, by the making of contributions of a type referred to in subsection (b)(2), or by the assumption of an enforceable commitment to bear the costs of a plan or program of a type referred to in this subdivision, or any combination thereof, where the aggregate of any payments, contributions, and costs is not less than the rate of pay described in subsection (b)(1) plus the amount referred to in subsection (b)(2).

(c) The term "employees", as used in this section, shall include employees of contractors or subcontractors performing jobs on various types of public works including mechanics, apprentices, teamsters, chauffeurs, and laborers engaged in the transportation of gravel or fill to the site of public works, the removal and/or delivery of gravel or fill or ready-mix concrete, sand, bituminous stone, or asphalt flowable fill from the site of public works, or the transportation or removal of gravel or fill from one location to another on the site of public works, and the employment of the employees shall be subject to the provisions of subsections (a) and (b).

(d) The terms "public agency" and "quasi-public agency" shall include, but not be limited to, the Rhode Island industrial recreational building authority, the Rhode Island economic development corporation, the Rhode Island airport corporation, the Rhode Island industrial facilities corporation, the Rhode Island refunding bond authority, the Rhode Island housing and mortgage finance corporation, the Rhode Island resource recovery corporation, the Rhode Island public transit authority, the Rhode Island student loan authority, the water resources board corporate, the Rhode Island health and education building corporation, the Rhode Island higher education assistance authority, the Rhode Island turnpike and bridge authority, the Narragansett Bay water quality management district commission, Rhode Island telecommunications authority, the convention center authority, the board of governors for higher education, the board of regents for elementary and secondary education, the capital center commission, the housing resources commission, the Quonset Point-Davisville management corporation, the Rhode Island children's crusade for higher education, the Rhode Island depositors economic protection corporation, the Rhode Island lottery commission, the Rhode Island

partnership for science and technology, the Rhode Island public building authority, and the Rhode Island underground storage tank board.

SAMPLE

**Appendix E**

**Site Plans Issued for Bid**

## **Appendix F**

### **Technical Specifications Issued for Bid**

**Appendix F**

**City of Pawtucket Standard Form of Agreement**

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PAWTUCKET CITY HALL FIRE DEPARTMENT  
RESCUE ROOM & KITCHEN RENOVATIONS  
137 ROOSEVELT AVE  
PAWTUCKET, RHODE ISLAND 02860

The drawings for this project represent an integral part of the contract documents, and should not be considered as a separate entity. They, along with the technical specifications, form a complete process of disseminating specific information required to perform the work of this project.

The following schedule indicates the drawings of this project, ordered for convenience only, and do not obligate the Contractor to perform the work in any specific sequence, nor construed as specific work for a specific trade, subcontractor or supplier.

- G1.0..... COVER SHEET
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- E4.0 ..... ELECTRICAL RISER DIAGRAM

E5.0 ..... ELECTRICAL SCHEDULES  
E6.0 ..... ELECTRICAL DETAILS

P0.0 ..... PLUMBING LEGEND, NOTES AND ABBREVIATIONS  
P1.0 ..... PLUMBING DEMOLITION AND NEW WORK PLANS  
P4.0 ..... PLUMBING SCHEDULES & DETAILS

**Drawings are dated: April 29, 2022**

## SECTION 01012

### CONTRACTOR'S USE OF THE PREMISES

#### PART 1 – GENERAL

##### 1.01 DESCRIPTION:

- A. Work Included: This Section applies to situations in which the Contractor or his representatives including, but not necessarily limited to, suppliers, subcontractors, employees, and field engineers, enter upon the Owner's property.
- B. Related Work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and sections of Division 1 of these specifications.

##### 1.02 QUALITY ASSURANCE:

- A. Promptly, upon award of the Contract, notify all pertinent personnel regarding requirements of this Section.
- B. Require that all personnel who will enter upon the Owner's property certify their awareness of and familiarity with the requirements of this Section.
- C. The Prime Contractor and his subcontractors shall wear an appropriate form of identification, whether it be a photo ID, shirt or jacket with company logo, etc.
- D. The Prime Contractor and his subcontractors shall park their personal vehicles in appropriate locations off the Owner's site. One company vehicle of the prime contractor may be parked on the site at any time unless otherwise authorized in writing, by the Owner.

##### 1.03 SUBMITTALS:

- A. Maintain an accurate record of the names and identification of all persons entering upon the Owner's property in connection with the work of this Contract, including times of entering and times of leaving, and submit a copy of the record to the Owner daily.

##### 1.04 TRANSPORTATION FACILITIES:

- A. Truck and equipment access:
  - 1. To avoid traffic conflict with vehicles of the fire station employees and fire department, and to avoid over-loading of streets and driveways elsewhere on the City's property, limit the access of trucks and equipment to the route provided by or directed by the Owner.
  - 2. Provide adequate protection for curbs and sidewalks over which trucks and equipment pass to reach the job site.
- B. Contractor's Vehicles:
  - 1. Contractor's vehicles, vehicles belonging to employees of the Contractor, and all other vehicles entering the Owner's property in performance of the work of the Contract, shall use only the access route provided by or directed by the Owner.

2. Do not permit such vehicles to park on any street or other area of the Owner's property except in the areas directed or provided by the Owner.
3. Contractor shall assume sole responsibility for all parking and traffic violation of employees, subcontractors, suppliers, etc.

1.05 SECURITY:

- A. Restrict the access of all persons entering upon the Owner's property in connection with the work to an Access Route authorized by the Owner.

1.06 GENERAL:

- A. Contain operations at site to areas permitted by:
  1. Law
  2. Ordinances
  3. Owner
  4. Contract Documents
- B. Do not unreasonably encumber site with materials or equipment.
- C. **Do not load the building or building components with weight that will endanger the structures.**
- D. Assume full responsibility for protection and safekeeping of products stored on premises.
- E. Move any stored products which interfere with operations of Owner or other Contractor.
- F. Obtain and pay for use of additional storage or work areas needed for operations.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION

## SECTION 01015

### EXISTING CONDITIONS

#### PART 1- GENERAL

##### 1.01 SUMMARY

###### A. EXISTING CONDITIONS SURVEY

- A. Before submitting a bid, the Contractor shall make a thorough examination of the conditions of the site, checking the requirements of the Plans and Specifications with the existing conditions.
- B. No claim for extra compensation or extension of time will be allowed on account of the Contractor's failure to estimate properly the quantities, locations and measurements of all items required to complete the work.
- C. The Contractor shall report any discrepancies to the Architect and request and interpretation before submitting a bid.
- D. The fire station shall will remain occupied for the duration of the Contract.
- E. Refer to the following test results for Asbestos Bulk, Lead Paint and Mold Sampling, consisting of four (17) pages, as completed by Atlantic Abatement Corporation. dated April 13, 2022.  
All Asbestos and Lead Paint sampling results tested negative for the presence of asbestos and lead. Traces of mold presence was found evident.

END OF SECTION

## SECTION 01070

### ARCHITECTURAL ABBREVIATIONS AND SYMBOLS

1.01 Reference to a technical society, institution, association or governmental authority is made in the Specifications in accordance with the following abbreviations:

AAMA	Architectural Aluminum Manufacturers Association
AASHO	American Association of State Highway Officials
AC OR ACOUS	Acoustical
ACI	American Concrete Institute
ADJ	Adjustable
A/E	Architect/Engineer
A.F.F.	Above Finish Floor
AIA	American Institute of Architects
AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AL or ALUM	Aluminum
ALS	American Lumber Standards
ALT	Alternate
A.P.	Access Panel
APA	American Plywood Association
APPROX.	Approximate
ARCH	Architectural
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
@	At
ATI	Asphalt Tile Institute
A/V	Audio Visual
AWI	Architectural Woodwork Institute
AWPA	American Wood Preserver's Association
AWPI	American Wood Preserver's Institute
AWS	American Welding Society
B.C.I.	Background Criminal Investigation
BD.	Board
BLK'G.	Blocking
BM.	Beam
BOTT. or BOT.	Bottom
BRK	Brick
BS or BACKSP.	Back Splash
BULL.BD.	Bulletin Board
CAB.	Cabinet
CARP.	Carpet
C.B.	Catch Basin
CEIL'G or CLG.	Ceiling
CHBD.	Chalkboard
CHEM.	Chemical or Chemistry
C.J.	Control Joint
CLOS.	Closet
C.M.U.	Concrete Masonry Units
COL.	Column
COMP.	Computer
CONC.	Concrete
CONC.BLK.	Concrete Block
CONF.	Conference

CONT. or CONTIN.	Continuous
CONTR.	Contractor
COV'RD.	Covered
CR.	Classroom
C.S.	Commercial Standard U.S. Department of Commerce
C.S.I.	Construction Specifications Institute
C.T.	Ceramic Tile
DEPT.	Department
DET.	Detail
D.F.	Drinking Fountain
DIM.	Dimension
DISP.	Dispenser
DR.	Door
D.S.	Drench Shower or Downspout (use applicable)
D.W.	Dish Washer
DWG.	Drawing
EL. or ELEV.	Elevation
ELEC.	Electrical
ELEV.	Elevator
ENT. or ENTR.	Entrance
EP. RES.	Epoxy Resin
EQ.	Equal
EQUIP.	Equipment
EXIST. or EXIST'G or E.	Existing
EXP.	Exposed
EXP. JT.	Expansion Joint
EXP. STR.	Exposed Structure
F.A.	Fresh Air
F.B.	Fiber Board
F.D.	Floor Drain
F.E.	Fire Extinguisher
FGJA	Flat Glass Jobbers Association
FIN	Finish(ed)
FL. or FLR.	Floor (ing)
FLG.	Flashing
F.M.	Factory Mutual
F.N.D.	Feminine Napkin Disposal
F.O.	Face Of
F.P.	Fire Proofing
FS	Federal Specification
G.A.	Gypsum Association
GALV.	Galvanized
G.B.	Glazed Block or Grab Bar
G.C.	General Contractor
GEN.	General
GL.	Glass
G.P.D.W.	Gypsum Drywall
G.W.B.	Gypsum Wallboard
GYP.	Gypsum
GYP. BD.	Gypsum Board
H.C.	Handicap
H.M.	Hollow Metal
H.M.U.	Hollow Masonry Unit
HT. or HGT.	Height
HVAC	Heating, Ventilating and Air Conditioning
ICBO	Uniform Building Code
IES	Illuminating Engineering Society



INSUL.	Insulation or Insulated
J. or JAN.	Janitor
KIT.	Kitchen
LAB.	Laboratory
LAD.	Ladder
L.A.R.R.	Liquid Applied Rubber Roofing
L.C.C.	Lead Coated Copper
L.W.S.	Liquid Writing Surface
M.	Man
MAN.	Manual
MAS. or MSRY.	Masonry
MAX.	Maximum
MECH.	Mechanical
MED.	Medium
MFGR. or MANF.	Manufacturer
MIA	Marble Institute of America
MIN.	Minimum
M. or MIR.	Mirror
MLMA	Metal Lath Manufacturers Association
M.O.	Masonry Opening
MOD.	Modular
MS	Military Specification
MSTD	Military Standard
MTD.	Mounted
MTL. or MET.	Metal
NAAMM	National Association for Architectural Metal Manufacturers
NAT.	Natural
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards'
NEC	National Electrical Code of NBFU
NFPA	National Fire Protection Association
N.F.R.	Nonwoven Fiberglass-Reinforced
NHLA	National Hardwood Lumber Association
N.I.C.	Not In Contract
NLMA	National Lumber Manufacturers Association
NO. or #	Number
NTMA	National Terrazzo and Mosaic Association, Inc.
N.T.S.	Not to Scale
NWMA	National Woodwork Manufacturers Association
O.C.	On Center
O. D.	Outside Diameter
OFF.	Office
O.H.	Overhead
O.I.	Owner's Insurance
OPP. HAND.	Opposite Hand
ORIG.	Original
OZ.	Ounce
PASS.	Passage
P.E.P.	Polyester Epoxy Paint
PL.	Plate
P.LAM.	Plastic Laminate
PLYD. or PWD.	Plywood
PNL.	Panel
PORT.	Portable
P.P.	Pitch Pocket
PREP.	Preparation
PROJ.	Project(ion)
PTD. or PT.	Painted

P.T.	Pressure Treated
P.T.D.	Paper Towel Dispenser
P.T.H.	Paper Towel Holder
PTN. or PART.	Partition
R.	Riser
R.B.	Rubber Base
R.D.	Roof Drain
REF.	Reference
REFRIG.	Refrigerator
REFIN.	Refinish
REQ'D or REQ.	Required
REINF.	Reinforced(ing)
RESIS.	Resistant
R.H.	Roof Hatch
R.L. or R.W.L.	Rain Water Leader
RM.	Room
R.T.U.	Roof Top Unit
RUB.	Rubber
R.V.	Roof Vent
R.V.T.	Reinforced Vinyl Tile
S.	Sink
SAN.	Sanitary
S.A.T.	Suspended Acoustical Tile
S.B.C.C.I.	Standard (Southern) Building Code
S.C.	Solid Core
SCHE.D.	Schedule
SCPI	Structural Clay Products Institutes
S.D.	Standard Detail or Soap Dispenser
SDI	Steel Deck Institute
SECT.	Section
SH. or SHLV.	Shelf - Shelving
SHT.	Sheet
SHWR.	Shower
SIM.	Similar
SMACNA	Sheet Metal and Air Conditioning Contractors National Association Inc.
S.N.D.	Sanitary Napkin Dispenser
SPEC.	Specification
SPR	Simplified Practice Recommendation, U.S. Department of Commerce
SSPC	Steel Structures Painting Council
STL. or ST.	Steel
STN. STL. or S.S.	Stainless Steel
STOR.	Storage
STRUCT.	Structural
SUPP.	Supplementary
SUSP.	Suspended
T. or TOIL.	Toilet
T.B. or TKBD.	Tackboard
TCA	Tile Council of America
TEL.	Telephone
TEMP.	Tempered
THK.	Thickness
TKS.	Thickness
T.M.	Tilt Mirror
T.O.S.	Top of Steel
TYP.	Typical
U.L.	Underwriter's Laboratories, Inc.
ULC	Underwriter's Laboratories of Canada
USA	U.S. of America Standards Association

U.V.	Unit Ventilator
VAR.	Varnish
V.A.T.	Vinyl Asbestos Tile
V.C.B.	Vinyl Cover Base
V.B.	Vinyl Base
VEST.	Vestibule
VERT.	Vertical
W.	Women
W/	With
WD.	Wood
WDW. or WIN.	Window
W.H.	Wall Hung
W.R.	Wall Receptacle
W.W.F.	Welded Wire Fabric

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION

## SECTION 01072

### DEFINITIONS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. The General Conditions and applicable portions of Division 1 of the Project Manual are a part of this Section.

##### 1.02 DEFINITIONS:

- A. Purchaser, City, Owner Agent, means the Owner.
- B. A/E shall mean the Architect who has a Contract with the Owner.
- C. Contractor shall mean the person or firm under Contract with the Owner to construct the project.
- D. "Furnish" and "provide" means to supply, erect, install and connect up complete in readiness for regular operation, particular work referred to, unless otherwise specified.
- E. "Supply" means purchase and delivery of material to the site.
- F. "Install" means to erect in place the supplied item.
- G. The term "Owner-Contractor Agreement" where used therein shall refer to the Owner's purchase order.
- H. The term "Change Order" where used herein shall refer to the Owner's purchase change order.
- I. Award of Contract and Date of Purchase Order refer to the same.
- J. "Day", as used throughout the contract unless otherwise stated, means "calendar day".

##### 1.03 THE WORK:

- A. The work comprises the completed construction and documentation required by the Contract Documents and includes all labor needed to produce such construction, and all materials and equipment incorporated or to be incorporated in such construction, and all manuals, reports, tests, releases, punch lists, operating instructions and the like to provide new work as shown on the Contract Documents.

##### 1.04 DATE OF SUBSTANTIAL COMPLETION:

- A. The Date of Substantial Completion of the Work or designated portion thereof, is the date certified by the Architect when construction is sufficiently complete, in accordance with the Contract Documents, so the Owner can occupy or utilize the Work or designated portion thereof, for the use for which it is intended.

1.05 DATE OF FINAL COMPLETION (FULLY COMPLETED):

- A. The Date of Final Completion of the Work is the date certified by the A/E when he finds all Work is acceptable and has been performed and completed in accordance with the terms and conditions of the Contract Documents.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION

**SECTION 01100**  
**SUMMARY OF THE WORK**

**PART 1 - GENERAL**

**1.01 SUMMARY**

**A. Project Identification:**

Pawtucket City Hall Fire Dept. Rescue Room & Kitchen Renovations  
137 Roosevelt Avenue  
Pawtucket, Rhode Island 02860

**B. The scope of work generally consists of the following:**

The renovation of the Pawtucket City Hall Fire Department's existing kitchen and conversion of the former dispatch room to new sleeping quarters for the rescue department.

**C. Permits and Fees:**

1. Apply for, obtain and pay for permits and fees required.
1. The Building permit will be issued by the State of Rhode Island Building Code Commission.
3. All other applicable permits will also be issued by the State of Rhode Island.
4. Submit copies of all permits to Architect.

**D. Codes: Comply with applicable codes and regulations of authorities having jurisdiction. Submit copies of inspection reports, notices and similar communications to Architect.**

**E. Dimensions: Verify dimensions indicated on drawings with field dimensions, prior to submitting Bid. Do not scale drawings.**

**F. Existing Conditions: Notify Architect of existing conditions differing from those indicated on the drawings.**

**1.02 RELATED WORK:**

**A. The General Conditions, Supplementary Conditions and applicable portions of Division 1 of the Project Manual are a part of this section which shall consist of all labor, equipment and materials necessary to complete all work indicated on the drawings, herein specified, or both; and as related to the project or projects defined in the Bidding and Contract requirements.**

**B. The specification format used herein is in accordance with the master CSI format, and in no way intends to restrict this Contractor from expediting his work as he sees fit, nor is there any intention of segregating the units of work as related to specific trades involving jurisdictional labor problems.**

**1.03 PROJECT COORDINATION:**

**A. The Contractor selected to complete work specified herein shall also be responsible for coordinating the work of other trades. All work or portions thereof shall be completed simultaneously.**

- B. The Contractor shall provide all work incidental to and necessary for a complete and proper installation of the specified and intended work of the Project.
- C. Prior to removing existing items, consult with Owner to determine which items will be turned-in to the Owner. If Owner does not wish to keep existing items, Contractor shall dispose of item in a legal and approved manner.
- D. Provide all core drilling and demolition work necessary to accommodate the specified work and all related work without creating structural or other damage. Patch and repair all wall, floor and ceiling assemblies with approved construction materials to match existing construction materials. Provide fire rated materials between fire separation wall assemblies, minimum two (2)-hour U.L. approved. Visit the site and become familiar with the intended work prior to submitting bid.
- E. Visit the site and become familiar with the specified and the intended work prior to submitting bid.
- F. Secure and pay for, as necessary for proper execution and completion of the work, and as applicable at time of receipt of bids, the following:
  - 1. All permits
  - 2. Government Fees
  - 3. Licenses
  - 4. Utility Company Charges.
- G. Give required notices.
- H. Lay out all work and be responsible for all lines, elevations and measurements. Verify the figures shown before laying out the work and be responsible for any error resulting from failure to do so.
- I. Notify all trades, subcontractors and suppliers of all designated alternative and be responsible for their coordination.
- J. Coordinate the work of all trades. All mechanical and electrical work shall be completed by qualified Contractors licensed in the State in which the work is being performed.
- K. The Contractor shall be responsible for carefully coordinating all proposed demolition work and new construction work with the Owner. The Owner must maintain use of the site during the Construction Phase. The Contractor may be required to complete work in several phases. Plan accordingly and include all related costs in the Base Bid. Consult Owner prior to submitting bid

1.04 GENERAL RESPONSIBILITIES OF THE CONTRACTOR:

- A. The Contractor shall be responsible for all personnel involved in the work, including those of his direct employ, his subcontractors and suppliers of materials and equipment and/or labor. The Technical Specifications have been divided for convenience only, to cover the Scope of Work, and where reference to a particular Contractor is noted, it is for convenience only. **The Owner and A/E recognize only one Contractor as a party to this Contract.**
- B. Except as specifically noted, provide and pay for:
  - 1. Labor, materials and equipment

2. Tools, construction equipment and machinery
  3. Water, heat and utilities required for construction - unless otherwise directed herein.
  4. Other facilities and services necessary for proper execution and completion of work
- C. Owner is exempt from sales tax on products permanently incorporated in the work.
- D. The Contractor and his subcontractors who are selected to complete the proposed new work shall have a minimum of five (5) consecutive years' experience providing similar work to that specified.
- E. Certain portions of the proposed new work may require structural, mechanical, fire sprinkler, and electrical work which may be described with notes only and may not be specifically drawn and/or detailed. The Contractor shall be responsible for engaging the services of a qualified State-Island Licensed Civil, Structural, Electrical, Mechanical, and/or Fire Sprinkler System Engineer to consult and/or design any work the Contractor and his subcontractors feel they are not familiar with. Furthermore, all civil, structural, mechanical, fire sprinkler system, and electrical work shall be completed by Qualified State-Licensed Contractors applicable to each discipline.
- F. This Contractor shall complete all work within the specified amount of days described in other sections herein.
- G. The Contractor shall be responsible for patching, repairing and restoring to original new condition, all portions of the site and building damaged and or adversely affected in any way during construction. The Owner and the Architect shall review and approve any and all new work and related restoration work prior to the Contractor considering work to be complete.
- H. Submit original receipts for all work completed with Allowance moneys. Do not utilize Allowance moneys without the written authorization of the Architect.
- I. The Contractor, upon Substantial Completion of this project, shall provide the Owner and Architect with a certified statement stating that all work has been provided in conformance with the Contract Documents, applicable manufacturer(s) written specifications and recommendations.
- J. This Scope of Work may be completed during the summer months or may lapse into the fall months. The Contractor shall prepare his bid as if the work will be completed during fall conditions.
- K. Provide all temporary and other related barriers and protection/prevention materials and equipment required to protect the property of the Owner and others and if applicable, to conform to Wetlands rules and regulations.
- L. The Contractor shall provide adequate dust control at each site throughout the duration of the Construction Phase.
- M. The Contractor shall install all products in strict conformance with these specifications and/or the manufacturers' written instructions and recommended practices, whichever is most stringent. No exceptions will be allowed.
- N. Comply with codes, ordinances, rule, regulations, orders and legal requirements of public authorities which bear on performance of work.
- O. Promptly submit written notice to A/E of observed variance of Contract Documents from legal requirements.



1. Appropriate modifications to Contract Documents will adjust necessary changes.
  2. Assume responsibility for work known to be contrary to such requirements, without notice.
- P. Enforce strict discipline and good order among employees. Do not employ persons not skilled in assigned task.
- Q. The Contractor shall provide all as-built reproducible drawings, disk and/or CD compatible with Owner's computer equipment at no additional cost to the Owner. The as-built drawings shall reflect actual systems installation and work completed. No exceptions will be allowed.
- R. The Contractor shall be responsible for patching, repairing and restoring to original new condition, all portions of the site and building damaged and or adversely affected in any way during construction. The Owner and the A/E shall review and approve any and all new work and related restoration work prior to the Contractor considering work to be complete. If any portion of the Owner's property is damaged during the course of construction, Contractor shall assume sole responsibility to complete repairs.
- 1.05 WORK BY OWNER:
- A. The Owner shall be responsible for removal of all rack servers and electrical components.
- 1.06 RESOLUTION OF CONTRACT DOCUMENT CONFLICTS OR CONFUSION:
- A. Conflicts or Confusion: Prior to submitting bid, the Contractor shall carefully study and compare the Contract Documents and shall request clarification in all cases of apparent conflict or confusion. **In case of conflict or confusion where the Contractor did not request clarification prior to submitting his bid, the Contractor shall interpret the Contract Documents to require the greater quantity, higher quality, most restrictive, and most expensive of the possible interpretations.**
- 1.07 PLANNING THE WORK:
- A. The Contractor shall plan his schedule to produce the work expeditiously in an orderly manner without interfering with the Owner's operations or the operations of other building tenants (occupants).
- B. Coordinate and carefully plan work described herein and as shown and described elsewhere and on the drawings.
- C. Owner shall be notified by the contractor at least seventy-two (72) hours prior to all "downtime" of systems involved in construction.
- D. The Contractor shall direct all questions and submittals to the office of the Architect, only. The Contractor shall assume all responsibility for work associated with the project if the Architect is not first advised.
- E. The Contractor shall visit the site and become familiar with the specified and the intended work prior to submitting his bid. No additional costs will be allowed for work obviously intended to be a part of this Contract. Architect's decision shall be final.
- F. Contractor shall be responsible for coordinating and cross-referencing all drawings and portions of the Project Manual. **DO NOT SEPARATE THE DRAWINGS AND PAGES OF THE PROJECT MANUAL.**

1.08 SAFETY PRECAUTIONS:

A. OSHA:

1. These construction documents of construction hereby contemplated are to be governed at all times by applicable provisions of the Federal Law (s), including but not limited to the latest amendments of the following:
  - a) Williams; Steiger Occupational Safety & Health Act of 1970, Public Law 91-956;
  - b) Part 1510 - Occupational Safety & Health Standards, Chapter XVII of Title 29, Code of Federal Regulations.
2. This project, the Contractor and his subcontractors shall, at all times, be governed by Chapter XIII of Title 29, Code of Federal Regulations, Part 1518 - Safety and Health Regulations for Construction, (36 FR 75), as amended to date.

B. Asbestos Abatement: Not applicable.

C. Emergencies:

1. Should a tornado, hurricane, gale or heavy wind warnings be issued, every practicable precaution shall be taken by the Contractor to minimize the danger to persons, to the work and to the adjacent property. Such damage caused to any part of the work shall be rectified or replaced to complete satisfaction of the A/E and at no expense to the Owner. Injury to personnel or damage to adjacent property because of the work shall be the complete responsibility of the Contractor, and he accepts exclusive liability for same.

D. Loading:

1. No part of any structure involved in this Contract shall be loaded during construction with a weight greater than it is calculated to carry with safety. Should any accidents or damage occur through any violation of this requirement, the Contractor shall be held solely responsible under his Contract and bond. When, in the opinion of the A/E, portions of the structure appear to be overloaded, it shall be the Contractor's responsibility to prove otherwise, or the Contractor shall follow the instructions of the A/E in connection with reduction of the loads.

E. Compliance with the Owner's Insurer, hereinafter referred to as OI.

1. If applicable, plans and final installation of Fire Suppression Systems are subject to acceptance by the OI.
2. All proposed uses of plastic construction materials shall be referred to the OI for review and appropriate recommendations.
3. Fire protection equipment shall be installed in conformance with the standards to the National Fire Protection Association (NFPA). Devices listed by Underwriters Laboratories Inc. (UL) or any other recognized testing laboratory shall be used.
4. Electrical installation shall conform to the National Electrical Code (NEC).
5. Combustible stock and processing equipment should not be moved into the buildings until recommended suppression systems are properly installed, tested, and in full service.
6. Fire prevention and protection during the construction period shall include the following:

- a) Use of public fire department, plant fire brigade, and portable extinguishing equipment.
- b) Early contract awards and expediting of fire protection equipment.
- c) Proper supervision of open flames and temporary wiring.
- d) Suitable access to the site with hydrants and water available on the site in early stages of construction.
- e) Supervision of welding or cutting operations, including use of flame-proofed tarpaulins.
- f) Keeping combustible material, including process equipment awaiting installation, to a minimum, and as far away as possible from buildings under construction.
- g) Keeping the construction site clean and orderly.
- h) Detaching Contractor's sheds from buildings under construction, if applicable.
- i) Special precautions such as shoring of masonry walls and temporary tie-bracing of structural steel work to prevent windstorm damage during construction.

1.09 WORK SEQUENCE:

- A. The Contractor shall plan his schedule to produce the work expeditiously in an orderly manner without interfering with the Owner's operations.
- B. Work Hours: all work shall be conducted between the normal working hours of 7:30 A.M. and 4:00 P.M. local time, and during regular weekdays, unless otherwise adjusted by the Owner. No work shall be performed before or after the normal working hours or during Saturdays, Sundays and Holidays as defined by the Department of Labor. The Owner may waive this requirement in an emergency situation.

PART 2 – PRODUCTS: Not Used

PART 3 – EXECUTION:

3.01 REQUIREMENTS:

- A. Maintain at job site, a minimum of one (1) copy of:
  - 1. Signed Contract Drawings
  - 2. Project Manual
  - 3. Addenda
  - 4. Reviewed Shop Drawings
  - 5. Change Orders
  - 6. Other Modifications to Contract
  - 7. Field Test Records
  - 8. Approved material samples
  - 9. As-built Drawings
- B. The Owner or Architect will accept only those Contract Documents that are signed or initialed and dated on each page.

- C. Store documents in field construction office(s), apart from documents used for construction.
- D. Provide files and racks for storage of documents.
- E. File documents in accordance with CSI Master Format.
- F. Maintain documents in clean, dry, legible condition.
- G. Do not use record document for construction purposes.
- H. Make documents available at all times for inspection by A/E and Owner.
- I. At Final Completion of the Project, turn over to the Architect, all Project Record Documents. All items such as reviewed shop drawings, Change Orders, test reports, etc. shall be delivered in bound book form and on CD, disk compatible with the Owner's and the Architect's computer systems.

### 3.02 RECORDING:

- A. Label each document "PROJECT RECORD DRAWINGS"
- B. Keep record documents current.
- C. Do not permanently conceal any work until required information has been recorded and inspected.
- D. Contract Drawings: Legibly mark to record actual construction.
  - 1. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
  - 2. Field change of dimension and detail.
  - 3. Changes made by Change Order or Field Order.
  - 4. Details not on original contract drawings.
- E. Specification and Addenda: legibly mark up each section to record:
  - 1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
  - 2. Changes made by change order or field order.
  - 3. Other matters not originally specified.
- F. Shop Drawings: Maintain as record documents; legibly annotate drawings to record changes made after review.

### 3.03 CUTTING AND PATCHING

- A. Execute cutting, fitting or patching or work, required to:
  - 1. Make several parts fit properly.

2. Uncover work to provide for installation of ill-timed work.
  3. Remove and replace defective work.
  4. Remove and replace work not conforming to requirements of Contract Documents.
  5. Install specified work in existing construction.
- B. In addition to contract requirements, upon written instruction of the A/E:
1. Uncover work to provide for A/E's observation of covered work, as required by the General Conditions.
  2. Remove samples of installed materials for testing; as required by the General Conditions.
  3. Remove work to provide for alteration of existing work.
- C. Do not endanger any work by cutting or altering work or any of it.
- D. Do not cut or alter work of another contractor without written consent of A/E.
- E. Prior to cutting which affects the structural integrity and safety of project work or that of another contractor, seek prior written notice to the Architect requesting consent to proceed with cutting. All such cutting shall be certified by a Rhode Island licensed structural engineer at no additional cost to the Owner or Architect. All related costs shall be the sole responsibility of the Contractor.
- F. Prior to cutting and patching done on instruction of AE, submit cost estimate.
- G. Should conditions of work, or schedule indicate change of materials or methods, submit written recommendation to A/E, including:
1. Conditions indicating change.
  2. Recommendations for alternative materials or methods.
  3. Submittals as required for substitutions.
- H. Submit written notice to A/E, designating time work will be covered, to provide for observation.
- I. Payment for costs caused by ill-timed or defective work, or work not conforming to Contract Documents, including costs for additional services of A/E, will be borne solely by the Contractor.
- J. Preparation (prior to cutting):
1. Provide shoring, bracing and support as required to maintain structural integrity.
  2. Provide protection for other portions of project.
  3. Provide protection from elements.

- K. Performance: Perform all work of fitting, adjustment, cutting, patching, finishing and restoration to perfectly match the quality as specified throughout these specifications

3.04 CONTRACTOR INSPECTION:

- A. Inspect existing conditions of work, including elements subject to movement or damage during cutting and patching.
- B. Repair/replacement of defective work will not constitute sufficient cause to extend the contract deadline

END OF SECTION

## SECTION 01113

### HAZARDOUS-MATERIALS PROCEDURES

#### PART 1 - GENERAL

##### 1.01 HAZARDOUS MATERIALS DISCOVERY

- A. The Owner has determined that there are hazardous materials to be encountered under the work of this Project.

##### 1.02 SECTION INCLUDES

- A. The Owner shall prepare abatement plan(s).
- B. The Prime Contractor shall be lead certified and responsible for the removal and disposal of all hazardous-containing materials that have been found on the site. It is the intent of the Owner to have the Contractor remove and dispose all lead hazardous materials in full accordance with the Rhode Island Department of Environmental Management (RIDEM), and the RIDEM's Regulations and Policies, as amended to date.
- C. Invoices for removal and abatement shall be accompanied by approved shipping documents which describe final disposal location, date or disposal, approved signatures and General Contractor signature of acknowledgment (ie, disposal manifests).

##### 1.03 RELATED WORK:

- A. Documents affecting work of this section including but not necessarily limited to General Conditions, Supplementary Conditions, and sections in Division 1 of these Specifications.

##### 1.04 RELATED REPORTS

- A. The Survey and Sampling Reports are included herein, following this page, consisting of:
  - 1. Limited Lead Paint Survey for existing communications room at the Pawtucket Fire Department located at Pawtucket City Hall Fall River City Hall, prepared by CBJ Environmental, LLC., dated April 13, 2022, three (3) pages total.
  - 2. Limited Mold Survey for the existing communications room and kitchen at the Pawtucket Fire Department located at Pawtucket City Hall Fall River City Hall, prepared by CBJ Environmental, LLC., dated April 13, 2022, nine (9) pages total.
  - 3. Limited Asbestos Survey for the existing communications room and kitchen at the Pawtucket Fire Department located at Pawtucket City Hall Fall River City Hall, prepared by CBJ Environmental, LLC., dated April 13, 2022, six (6) pages total.
  - 4. CONTRACTOR NOTE WELL: Quantities and estimated removal costs if applicable, are for reference only. The Contractor shall verify all quantities and assume all costs relative to the complete and proper removal and disposal of hazardous-materials abatement.

1.05 ABATEMENT PROCEDURES (By the Contractor)

- A. Provide other abatement-related services not specifically described herein, but needed for a complete and proper job.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION



# CBJ Environmental, LLC

April 13, 2022

Atlantic Abatement Corporation  
15 Lark Industrial Drive  
Smithfield, RI 02828

Lead Paint Sampling Results - 137 Roosevelt Avenue, Pawtucket, RI 02860

Dear Ms. Alexa Brynes,

On April 6, 2022, CBJ Environmental, LLC (CBJ) conducted paint chip sampling at 137 Roosevelt Ave in Pawtucket. Laboratory analysis of lead in paint using SOP based on SW846-7420/3051 resulted in results above the reporting limit. Lead Based Paint should be handled in accordance with Local, State and Federal regulations.

CBJ would like to thank you for the opportunity to have serviced **'s** environmental testing needs. If you have any questions regarding the completed testing, please do not hesitate to call.

Sincerely,

A handwritten signature in black ink that reads "Brandi Jacobs". The signature is written in a cursive, flowing style.

Brandi Jacobs  
President



SanAir ID Number  
**22016739**  
FINAL REPORT  
4/8/2022 9:20:35 AM

**Name:** Accurate Analysis LLC  
**Address:** 23 Midstate Drive  
Suite 202  
Auburn, MA 01501  
**Phone:** 508-407-8251

**Project Number:** J22040  
**P.O. Number:**  
**Project Name:** CBJ  
**Collected Date:** 4/4/2022  
**Received Date:** 4/6/2022 10:10:00 AM

Dear Sir or Madam,

We at SanAir would like to thank you for the work you recently submitted. The 2 sample(s) were received on Wednesday, April 06, 2022 via FedEx. The final report(s) is enclosed for the following sample(s): 1, 2.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

A handwritten signature in black ink that reads "Abisola Kasali".

Abisola Kasali  
Metals Laboratory Director  
SanAir Technologies Laboratory

- Final Report Includes:
- Cover Letter
  - Analysis on Test Family AA
  - Disclaimers and Additional Information

- Sample conditions:
- 2 samples in Good condition.



SanAir ID Number  
**22016739**  
 FINAL REPORT  
 4/8/2022 9:20:35 AM

**Name:** Accurate Analysis LLC  
**Address:** 23 Midstate Drive  
 Suite 202  
 Auburn, MA 01501  
**Phone:** 508-407-8251

**Project Number:** J22040  
**P.O. Number:**  
**Project Name:** CBJ  
**Collected Date:** 4/4/2022  
**Received Date:** 4/6/2022 10:10:00 AM

Analyst: Baird, Marti  
 Test Method: SW846/M3050B/7000B

### Lead Paint Analysis

PAIN Sample	Description	µg Pb In Sample	Sample Size (grams)	Calculated RL	Sample Results	Sample Results
22016739 - 1	1 Communications Rm - Ceiling	313	0.1066	93.8	2932 µg/g (ppm)	0.293 % By Weight
22016739 - 2	2 Communications Rm - Walls	623	0.1029	97.2	6053 µg/g (ppm)	0.605 % By Weight

Method Reporting Limit <10 µg/0.1 g paint

Signature:

Date: 4/7/2022

Reviewed:

Date: 4/7/2022

# CBJ Environmental, LLC

April 13, 2022

Atlantic Abatement Corporation  
15 Lark Industrial Drive  
Smithfield, RI 02828

Mold Investigation – 137 Roosevelt Avenue, Pawtucket, RI 02860

Dear Ms. Alexa Brynes:

CBJ Environmental, LLC (CBJ) conducted a mold investigation at the Fire Station in the Communications Room and Kitchen area of the property located at 137 Roosevelt Avenue, Pawtucket, RI 02860 on April 6, 2022. Mr. Ronald Jacobs performed the collection of Direct Microscopy of Fungal Structures samples.

The visual assessment identified visible water damage and growth in the Communications Room on the ductwork and in the Kitchen sink area. CBJ Environmental collected Direct Microscopy of Fungal Structures samples from the Communications ductwork and kitchen sink area of the property.

Attached is the lab report identifying the species and levels that were identified. The results indicate medium to high levels of Cladosporium in the communication duct area. Please note that all the windows were closed adjacent to the area that was sampled, and the weather was moderately dry.

CBJ concludes that there are signs of significant mold growth in the Communications Room on the ductwork. CBJ recommends that the damaged and porous materials be removed, cleaned and treated with a fungicide cleaning solution.

If you have any questions regarding the information this report, please contact us by email or phone at 508-458-5974.

Sincerely,



Brandi Jacobs  
President  
CBJ Environmental, LLC

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## Asbestos Identification Laboratory.

165 New Boston St., Ste 227  
Woburn, MA 01801  
781-932-9600

Web: [www.asbestosidentificationlab.com](http://www.asbestosidentificationlab.com) Email:  
[mikemanning@asbestosidentificationlab.com](mailto:mikemanning@asbestosidentificationlab.com)



**Batch: 77762**

### Project Information

137 Roosevelt St.,  
Pawtucket,  
RI

*Method: Based on ASTM D7658-17  
Standard Test Method for Direct  
Microscopy of Fungal Structures from  
Tape.*

Patti Riley  
Enviro Safe Engineering  
203 Prospect St.  
Brockton, MA

Dear Patti Riley,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project. The information and analysis contained in this report have been generated using the ASTM D7658-17 Standard Test Method for Direct Microscopy of fungal structures. This test method uses optical microscopy for the detection, semi quantification, and identification of fungal structures in direct extraction samples. Spores occurring in chains are counted individually. Spores lacking distinguishing characteristics are reported as "unidentified spores". Spores of aspergillus and penicillium are difficult to distinguish and are reported as aspergillus/penicillium. The loading of fungal material is reported using a scale of categories 0-5. Category 0 is assigned when no fungal material is observed. Category 1 is assigned when the fungal material loading covers less than 5% of a representative field of view. Category 2 is assigned when the fungal material loading covers between approximately 5% and 25% of a representative field of view. Category 3 is assigned when the fungal material loading covers between approximately 25% and 75% of a representative field of view. Category 4 is assigned when the fungal material loading covers between approximately 75% and 90% of the representative field of view. Category 5 is assigned when fungal material loading covers greater than approximately 90% of a representative field of view. A scale of 0 to 5 is used to rate abundance of non-fungal material (Debris), with 5 indicating the largest amount. Large amounts of debris may obscure small spores. Therefore, counts from samples with 4 or higher non-fungal material may be treated as under counts and analysis will not continue. The data contained in the report should be interpreted by the party that performed the on-site assessment from which the samples were collected and that has access to the data quality objectives used in the project for which the sample was collected (for example, notes on sample condition, substrate, loading, analytical problems, etc.).

All samples were received in acceptable condition unless noted in the body of the report. Due to the nature of the analyses performed, field blank correction of results is not applied. The results relate only to the items tested. Asbestos Identification Laboratory results represent the analysis of samples as submitted by the customer. Information regarding sample location, description, area, volume, etc., was provided by the customer. Asbestos Identification Laboratory is not responsible for sample collection activities or analytical method limitations.

Asbestos Identification Laboratory shall have no liability to the client or the client's customer with the respect to decisions or recommendations made, actions taken or course of conduct implemented by either the client or the client's customer as a result of or based upon the Test Results. In no event shall the Laboratory be liable to the client with respect to the Test Results. Reports are kept at Asbestos Identification Laboratory for three years. This report shall not be reproduced, except in full, without the written consent of Asbestos Identification Laboratory.

AIHA Laboratory Accreditation Program's, LLC Environmental Microbiology Laboratory Accreditation Program (EMLAP)  
Laboratory ID: LAP-200379

Thank you Patti Riley for your business.

Michael Manning Owner/Director 781-932-9600

# Glossary of Terms and Color Coding

## Fungal Loading Categories

The loading of fungal material is reported using a scale of categories 0-5.

<b>Category 0</b>	Is assigned when no fungal material is observed on Direct Read sample.
<b>Category 1</b>	Is assigned when the fungal material loading covers less than 5% of a field of view on the Direct Read sample.
<b>Category 2</b>	Is assigned when the fungal material loading covers between approximately 5% to approximately 25% of a field of view on the Direct Read sample.
<b>Category 3</b>	Is assigned when the fungal material loading covers between approximately 25% to approximately 75% of a field of view on the Direct Read sample.
<b>Category 4</b>	Is assigned when the fungal material loading covers between approximately 75% to approximately 90% of a field of view on the Direct Read sample.
<b>Category 5</b>	Is assigned when the fungal material loading covers greater than approximately 90% of a field of view on the Direct Read sample.

## Debris Rating

Most Direct Read samples typically contain some non-microbial particles. High levels of non-microbial particles on a Direct Read sample will bias the analysis by obscuring or covers spores. Debris Rating is reported using a scale 0-5.

<b>Debris Rating 0</b>	No particle matter detected on Direct Read sample.
<b>Debris Rating 1</b>	Minimal to approx. 5% particle matter detected on Direct Read sample.
<b>Debris Rating 2</b>	Approx. 5% to approx. 25% particle matter detected on Direct Read sample.
<b>Debris Rating 3</b>	Approx. 25% to approx. 75% particle matter detected on Direct Read sample.
<b>Debris Rating 4</b>	Approx. 75% to approx. 90% particle matter detected on Direct Read sample.
<b>Debris Rating 5</b>	Greater than approx. 90% particle matter detected on Direct Read sample.

## Fungal Loading Color Codes

<b>Red</b>	If any spores that indicate moisture or chronic condensation are detected, (Alternaria, Chaetomium, Stachybotris, Ulocladium) the fungal load will be highlighted in Red.
<b>Orange</b>	If any spores that indicate humid conditions, condensation and or poor ventilation are detected, (Aspergillus/Penicillium or Cladosporium) the fungal load will be highlighted in Orange.

<b>FieldID</b>	01	<b>Debris Rating</b>
<b>LabID</b>	685	2
<b>Location</b>	Communications - Duct	
<b>Fungal Spore Type</b>		<b>Fungal Loading</b>
Alternaria		0
Chaetomium		0
Stachybotrys		0
Ulocladium		0
Aspergillus/Penicillium		0
Cladosporium		3
Ascospore		1
Basidiospores		1
Curvularia		0
Drechslera/Bipolaris		0
Hyphal Structure		3
Miscellaneous/Unidentified		2
Smuts/Myxomycetes		0

<b>FieldID</b>	02	<b>Debris Rating</b>
<b>LabID</b>	686	2
<b>Location</b>	Kitchen - Sink Area	
<b>Fungal Spore Type</b>		<b>Fungal Loading</b>
Alternaria		0
Chaetomium		0
Stachybotrys		
Ulocladium		0
Aspergillus/Penicillium		0
Cladosporium		0
Ascospore		0
Basidiospores		0
Curvularia		0
Drechslera/Bipolaris		0
Hyphal Structure		1
Miscellaneous/Unidentified		1
Smuts/Myxomycetes		0

Sampled: April 04, 2022

Received: April 05, 2022

Analyzed: April 07, 2022

Thursday 07 April 2022

*Erik Borgas*

Analyzed by:

Batch: 77762

# Glossary of Fungal Spores

<b>Alternaria</b>	Is a common outdoor and indoor mold. Alternaria is an indicator of moisture or chronic condensation. Alternaria species are known as major plant pathogens. They are also common allergens in humans, growing indoors and causing hay fever or hypersensitivity reactions that sometimes lead to asthma. They readily cause opportunistic infections in immunocompromised people such as AIDS patients. Causes hypersensitivity pneumonitis and bronchitis. Alternaria is regarded as the main cause of allergy and asthma in children aged 6-11 years. They are known to produce over 70 various mycotoxins.
<b>Ascospore</b>	An ascospore is a spore contained in an ascus or that is produced inside an ascus by a member of the Ascomycota phylum. Ascospores are formed under optimal condition and are often release when relative humidity is high. There are over 64,000 different species of fungus that produce ascospores.
<b>Aspergillus/Penicillium</b>	Are common outdoor and indoor mold. These spores are combined because the spores are so similar they cannot be reliably separated into their respective genera. Aspergillus species are common contaminants of starchy foods ( such as bread and potatoes) and grow in or on many plants and trees. Some can cause infections in humans or other animals. Penicillium species are present in the air and dust of indoor environments, such a homes and public buildings. The fungus can be readily transported from the outdoors, and grow indoors using building material or accumulated soil to obtain nutrients for growth. Aspergillus/Penicillium are indicators or moisture or chronic condensation. They also show presence of significant amounts of toxigenic (toxin producers) and/or allergenic (causing allergenic reactions).
<b>Basidiospores</b>	A Basidiospore is a reproductive spore produced by Basidiomycete fungi, a grouping that includes mushrooms, shelf fungi, rusts, and smuts. These spores serve as the main air dispersal units for the fungi. The spores are released during periods of high humidity.
<b>Chaetomium</b>	Chaetomium is a genus of fungi in the chaetomiaceae family. It is a dark walled mold normally found in soil, air, cellulose and plant debris. It is an indicator of moisture or chronic condensation. They also show presence of significant amounts of toxigenic (toxin producers) and/or allergenic ( causing allergenic reactions). Often found together with Stachybotrys.
<b>Cladosporium</b>	Cladosporium is a genus of fungi including some of the most common indoor and outdoor molds. Many species of Cladosporium are commonly found on living and dead plant material. Cladosporium spores are wind-dispersed and they are often extremely abundant in outdoor air. Indoors Cladosporium species may grow on surfaces when moisture is present. They also show presence of significant amounts of toxigenic (toxin producers) and/or allergenic (causing allergenic reactions).
<b>Curvularia</b>	Curvularia is a mold fungus which is a facultative pathogen of many plant species and common in soil and decaying plant matter. Curvularia can be a potential allergen to human beings, but usually don't pose a major health effect to healthy people. Curvularia is not known to produce any mycotoxins that can be harmful to people. Immunocompromised humans can develop adverse health issues due to exposure to Curvularia.
<b>Drechslera/Bipolaris</b>	Two genera of fungi having similar cylindrical spores. Drechslera is a genus of fungi. Many of the species in this genus are plant pathogens. Bipolaris is a common outdoor mold that thrives in decaying plant matter. Bipolaris is also known as a plant pathogen that grows on grasses. Although some people may have an allergy to Bipolaris, it normally doesn't have an advers effect on humans. Bipolaris would potentially endanger people who are immunocompromised (having HIV or AIDS).
<b>Hyphal Structure</b>	A Hypha is a long, branching filamentous structure of fungus. In most fungi, hyphae are the main mode of vegetative growth, and are collective called a mycelium.
<b>Miscellaneous/Unidentif</b>	Fungal structure having characteristics inconsistent with all reported categories.
<b>Smuts/Myxomycetes</b>	The Smuts are multicellular fungi characterized by their large numbers of teliospores. The Smuts get their name from a Germanic word for dirt because of their dark, thick-walled, and dust-like teliospores. The Smuts are grouped with Myxomycetes because of their commonalities concerning sexual reproduction. Smuts are cereal and crop pathogens that most notably affect members of the grass family and sedges.
<b>Stachybotrys</b>	Stachybotrys is a genus of molds. Historically, it was considered closely related to the genus Memnoniella, because the spores are produced in slimy heads rather than in dry chains. A species is known as "black mold" and are frequently associated with poor indoor air quality that arises after fungal growth on water-damaged building materials. They also show presence of significant amounts of toxigenic (toxin producers) and/or allergenic (causing allergenic reactions). It has been implicated as cause of: asthma attacks, conjunctivitis, inflammation of the mucus membranes of the respiratory system and skin irritation.
<b>Ulocladium</b>	Ulocladium is a genus of fungi. Species of this genus contain both plant pathogens and food spoilage agents. Some members of the genus can invade homes and are a sign of moisture because the mold requires water to thrive. They can cause plant diseases or hay fever and more serious infections in immune-suppressed individuals. They also show presence of significant amounts of toxigenic (toxin producers) and/or allergenic (causing allergenic reactions).



Patti Riley  
Enviro Safe Engineering  
203 Prospect St.  
Brockton, MA

Project Information

137 Roosevelt St.,  
Pawtucket,  
RI

*Method: Based on ASTM D7658-17  
Standard Test Method for Direct  
Microscopy of Fungal Structures from  
Tape.*

**References**

The Air Spora by Maureen E. Lacey and Jonathan S. West

Centers for Disease Control and Prevention

ASTM International

MBL Mold and Bacteria Laboratories

Bassett, I.J., C.W. Crompton, and J.A. Parmelee. 1978. An atlas of airborne pollen grains and common fungus spores of Canada. Canada Department of Agriculture Monograph 18: 1-321.



Client: **CBT Environmental, LLC**  
 Address: **P.O. Box 563, Bellingham, WA 98209**  
 Project Site: **137 Roosevelt St, Buxton, WA**  
 Contact: **Brandi Jacobs**  
 Phone: **508-458-4159**

**CHAIN OF CUSTODY - MOLD**  
**Asbestos Identification Laboratory**  
 165 New Boston Street  
 Suite 227  
 Woburn, MA 01801  
 (781) 932-9600  
 Rev. 2/2020



Email: **brandi@cbtenvironmental.com**  
 Relinquish by/date: **BR 4/5/22**

Received by/date: **BR 4/5/22**  
 # of Samples Received: **2**

Date Sampled: **4/4/22**  
 Analyzed By: *[Signature]*  
 Date Analyzed: **4/7/2022**  
 Batch No.: **77763**

Page **1** of **1**  
 Type  Spore Trap  
 Direct Read  
 Turnaround Time  
 Less 3 Hrs  
 Same Day  
 Next Day  
 Two Day  
 Three Day

Sample ID	Location	Container	Volume	Analysis	Notes
01	Communications - Duct	02			
02	Kitchen - Sink Area				
03					
04					
05					
06					
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Comments:

10

10





*This is to certify that*

**Ronald R. Jacobs**

*has attended the 16-hour course*

# Mold Investigation and Remediation

Course Location

Holiday Inn  
31 Hampshire Street Mansfield, MA 02048

January 29-30, 2018

Course Dates

18-1570-807-214403

Certificate Number

January 30, 2018

Examination Date

Training Director

16 Upton Drive, Wilmington, MA 01887

Telephone 978.658.5272

[www.ieetrains.com](http://www.ieetrains.com)

# INSTITUTE FOR ENVIRONMENTAL EDUCATION

April 13, 2022

Atlantic Abatement Corporation  
15 Lark Industrial Drive  
Smithfield, RI 02828

Asbestos Survey: 137 Roosevelt Avenue, Pawtucket, RI 02860

Dear Ms. Alexa Brynes:

CBJ Environmental, LLC conducted a limited asbestos survey at the Fire Station located at 137 Roosevelt Avenue, Pawtucket, RI 02860 on April 6, 2022. The survey was limited to upcoming interior renovation. The Asbestos survey was conducted in accordance with relevant State and Federal Regulations and in compliance with 40 CFR Part 61, Subpart M, NESHAP Renovation and Demolition Standard.

In accordance with 29 CFR 1926.1101 and 1910.1001, all material that is not identified as non-suspect material or non-asbestos containing by laboratory analysis should be treated as Presumed Asbestos Containing Material (PACM) and that material will be considered asbestos until proven otherwise.

Licensed and trained asbestos personnel should remove any ACM or PACM that is to be disturbed by renovations of the building. Written notification is required by state and local regulations prior to beginning any work on ACM. Send written notification, as required by USEPA NESHAP Asbestos Regulations 40 CFR 61 Sub Part M, to the designated regional NESHAP notification office and any other state and local regulating body at least 10 working days prior to beginning any work on ACM.

Any areas where ACM or PACM may be present, and will be affected by renovation, rehabilitation or construction activity, shall be subject to all applicable regulations and guidelines below.

SAMPLE ID	LOCATION	DESCRIPTION	COLOR	ASBESTOS	Quantity
No Asbestos Containing Material Detected Based on Samples Taken.					

**Any abatement, monitoring and clearance activity must be conducted in accordance with the following regulations:**

*EPA 40 CFR Part 61, "NESHAP", OSHA 29 CFR 1910. and 1926., NIOSH Recommendations, and any other applicable Federal, State and Local government regulations and guidelines concerning asbestos or related construction activities.*

We appreciate the opportunity to be of service on this project and look forward to working with **Atlantic Abatement** on future projects. If you have any questions regarding the information this report, please contact me directly at 508-458-5974.

Sincerely,

*Brandi Jacobs*

Brandi Jacobs  
President



23 Midstate Dr., #202, Auburn, MA 01501

4/8/2022

CBJ Environmental LLC  
16 Grove Street  
Bellingham, MA 02019

Project Number: J22040  
P. O. Number: N/A  
Project Site: 137 Roosevelt St. Pawtucket, RI (Fire House)  
Batch Number: 2200281

Dear Brandi Jacobs,

We would like to thank you for submitting your samples to Accurate Analysis. We appreciate your business.

The final lab results have been achieved by calibrated visual estimate (CVE) using the EPA 600/R-93/116 and EPA 600/M4-82-020. The results indicated in this report only pertain to samples received for this project. Accurate Analysis assumes no responsibility for the sampling procedure and will provide quality control data related to the samples tested upon written request.

This report may not be used by anyone to claim product endorsement by NIST/NVLAP or any other agency of the U.S. Government.

Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Accurate Analysis recommends gravimetric reduction or TEM analysis for non-detected samples.

A handwritten signature in black ink, appearing to read "Sophetra Ken".

Sophetra Ken  
Lab Director

Certifications:

NVLAP :600312-0  
Massachusetts: AA000254  
Rhode Island: PLM00151



23 Midstate Dr., #202, Auburn, MA 01501 Phone 508-407-8251

Client Name: CBJ Environmental LLC
Client Address: 16 Grove Street
Bellingham, MA 02019
Client Contact: Brandi Jacobs
Contact Info: brandi@cbjenvironmental.com

Project Site: 137 Roosevelt St. Pawtucket, RI (Fire House)
Client Project #: J22040
Client P. O. #: N/A
Date Sampled: 4/4/2022
Date Received: 4/5/2022

Accurate Analysis
Batch Number
2200281
Final Report
4/8/2022 8:12:23 AM

Asbestos Bulk PLM EPA-600/R-93/116 & EPA-600/M4-82-020

Table with 6 columns: Lab sample ID/Sample ID/Location, Client, Stereoscopic Appearance, % Fibrous, % Non-fibrous, Asbestos Fibers/Asbestos Color. Rows include samples 1.0 through 10.0 with descriptions like 'FT - Bottom Layer/Communications Rm' and 'Gypsum Board/Kitchen Wall'.

Signature: [Handwritten Signature]
Analyst Name: Mark Derosier
Date Analyzed: 4/7/2022



# ACCURATE ANALYSIS

## PLM Chain of Custody

23 Midstate Dr. #202, Auburn, MA 01501 508-407-8251

Turn around time in business days, circle one:  
 3 hrs. 6 hrs. SD 24hrs. 48 hrs. **72 hrs.**

Client: CBU Environmental, LLC  
 Address: 16 Grove Street Bellingham, MA 02019  
 Stop on first positive:  Yes  No If not specified the lab will analyze all samples  
 Requested Instructions:   
 Relinquished By: *Brandi Jacobs* Date/Time: *4/5/22*  
 Accurate Batch # **7200284**

Project #: *122040* PO:   
 Project Site: *137 Roosevelt St, Pawtucket - RI*  
*Five House*  
 This area for lab use only  
 Received By Lab: *MARN D* Date/Time: *4-5-22 1:30PM*  
 # of Samples Received:   
 Results: email verbal By: *Brandi Jacobs* Date:   
 Analyt / Date: *4-8-22* QC by / Date:

Contact: Brandi Jacobs  
 Phone/Email: 508-458-5974 brandi@cbjenvironmental.com

Sample ID	Date Sampled	Location	Description
01	4/4/22	Communications Rm	<del>13X12</del> Floor Tile - Bottom layer
02	✓		Assoc Mastic - Black
03	✓		13X12 Floor Tile - Top layer
04	✓		Assoc Mastic - Yellow
05A	✓	Ceiling	SKin Coat - white
05B	✓	wall	↓
06A	✓	Ceiling	Base Plaster - Gray
06B	✓	wall	↓
07	✓	Kitchen - wall	Gypsum Board
08	✓	Sink	Under Coating

**Rhode Island Department of Health**

**Asbestos Program**

**Asbestos Inspector**

**RONALD R JACOBS**

**Exp. Date: 01/31/2023**

**License #: AI00918**

**Member of C.O.N.E.S.**



## SECTION 01300

### SCHEDULING

#### PART 1 – GENERAL

##### 1.01 SUMMARY

- A. Working hours shall be between 7:30 a.m. and 4:00 p.m., Monday through Friday. The contractor will not be allowed to work on holidays observed by the State of Rhode Island. A list of these holidays can be obtained from the State of Rhode Island official website.

##### 1.02 DESCRIPTION:

- A. Work Included: To assure adequate planning and execution of the work so that the work is completed within the number of calendar days allowed in the Contract, and to assist the Architect in appraising the reasonableness of the proposed schedule and in evaluating progress of the work, prepare and maintain the schedules and reports described in this section.

- B. Related Work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
2. Requirements for Progress Schedule: General Conditions.
3. Construction Period: Form of Agreement.

##### 1.03 QUALITY ASSURANCE:

- A. Employ a scheduler who is thoroughly trained and experienced in compiling construction schedule date, and in preparing and issuing periodic reports as required below.
- B. Perform data preparation, analysis, charting, and updating in accordance with standards approved by the Architect.
- C. Reliance upon the approved schedule:
  1. The construction schedule as approved by the Architect will be an integral part of the Contract and will establish interim completion dates for the various activities under the Contract.
  2. Should any activity not be completed within seven (7) days after the stated scheduled date, the Owner shall have the right to require the Contractor to expedite completion of the activity by whatever means the Owner deems appropriate and necessary, without additional compensation to the Contractor.

3. Should any activity be thirty (30) days or more behind schedule, the Owner shall have the right to perform the activity or have the activity performed by whatever method the Owner deems appropriate.
4. Costs incurred by the Owner and by the Architect in connection with expediting construction activity under this Article shall be reimbursed by the Contractor.
5. It is expressly understood and agreed that failure by the Owner to exercise the option either to order the Contractor to expedite an activity or to expedite the activity by other means shall not be considered to set a precedent for any other activities or waive the Owner's right to do so.

#### 1.04 SUBMITTALS:

- A. Submit initial schedules within seven (7) calendar days after date of Award of Contract.
  1. A/E will review schedules and, if changes are required by A/E, return reviewed copy within five (5) workdays after receipt.
  2. If required, Contractor shall resubmit within five (5) workdays after return of reviewed copy.
- B. Submit monthly, updated schedules accurately depicting progress to first day of each month.
- C. Comply with pertinent provisions of Section 01300.

#### 1.05 FORM OF SCHEDULE:

- A. Prepare in form of horizontal bar chart:
  1. Provide separate horizontal bar column for each trade or operation.
  2. Order: Chronological order of beginning of each item of work.
  3. Identify each column:
    - a) By major specification number.
    - b) By distinct graphic delineation.
  4. Horizontal Time Scale: Identify first workday of each week.
  5. Scale and Spacing: To allow space for updating.
- B. Minimum sheet size: 11" × 17".

#### 1.06 CONTENT OF SCHEDULE:

- A. Provide complete sequence of construction by activity.
  1. Decision dates for:
    - a) Products specified by allowances.
    - b) Selection of finishes.
  2. Dates for beginning and completion of each element of construction.
- B. Identify work of separate floors, or separate phases, or other logically grouped activities.
- C. Show projected percentage of completion for each item of work as of the first day of every other week.

1.07 UPDATING:

- A. At least every other week, show all changes occurring since previous submission of updated schedule.
- B. Indicate progress of each activity, show completion dates.
- C. Include:
  - 1. Major changes in scope.
  - 2. Activities modified since previous updating.
  - 3. Revised projections due to changes.
  - 4. Other identifiable changes.

1.08 DISTRIBUTION:

- A. Distribute copies of reviewed schedules to:
  - 1. Job site file.
  - 2. Subcontractor.
  - 3. Other concerned parties.
- B. Instruct recipients to report any inability to comply, and provide detailed explanation with suggested remedies.

PART 2 – PRODUCTS:

Not Used.

PART 3 – EXECUTION:

Not Used.

END OF SECTION

## SECTION 01330

### SUBMITTALS - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. Consult the individual sections of the specifications for the specific submittals required under those sections and for further details and descriptions of the requirements.

##### 1.02. GENERAL PROCEDURES FOR SUBMITTALS

- A. Timeliness - The Contractor shall transmit each submittal to the Architect sufficiently in advance of performing related Work or other applicable activities, so that the installation not be delayed by processing times, including disapproval and resubmittal (if required), coordination with other submittals, testing, purchasing, fabrication, delivery, and similar sequenced activities. No extension of time will be authorized because of the Contractor's failure to transmit submittals to the Architect in advance of the Work.
- B. Contractor's Review and Approval - Only submittals received from and bearing the stamp of approval of the Contractor will be considered for review by the Architect. Submittals shall be accompanied by a transmittal notice stating name of Project, date of submittal, "To", "From", (Contractor, Subcontractor, Installer, Manufacturer, Supplier), Specification Section, or Drawing No. to which the submittal refers, purpose(first submittal, resubmittal), description, remarks, distribution record, and signature of transmitter.
- C. Or-Equals - On the transmittal or on a separate sheet attached to the transmittal, the Contractor shall direct attention to any deviations including minor limitations and variations, from the Contract Documents.
  - 1. The Contractor and all Subcontractors shall submit to the Architect for consideration of any Or-Equal substitution, a written point by point comparison containing the name and full particulars of the proposed product to the product named or described in the Contract Documents.
  - 2. Upon receipt of a written request for approval of an Or-Equal substitution, the Architect shall investigate whether the proposed item shall be considered equal to the item named or described in the Contract Documents. Upon conclusion of the investigation, the Architect shall promptly advise that the item is, or is not, considered acceptable as an Or-Equal substitution. Such written notice must have the concurrence of the Administrator.
  - 4. In no case may an item be furnished on the Work other than the item named or described, unless the Architect considers the item equal to the item so named or described.
  - 5. The equality of items offered as "equal" to items named or described shall be proved to the satisfaction of the Architect at the expense of the Contractor or Subcontractor submitting the substitution.
  - 6. The Architect may require that full size samples of both the specified and proposed products be submitted for review and evaluation. The Contractor or

Subcontractor, as the case may be, shall bear full cost for providing, delivering, and disposal of all such samples.

7. The Contractor or Subcontractor, as the case may be, shall assume full responsibility for the performance of any item submitted as an "Or-Equal" and assume the costs of any changes in any Work which may be due to such substitution.

- D. Processing- All costs for printing, preparing, packaging, submitting, resubmitting, and mailing, or delivering submittals required by this contract shall be included in the Contract Sum.

#### 1.03 ARCHITECT'S ACTION

- A. The Architect will review the Contractor's submittals and return them with one of the following actions recorded thereon by appropriate markings:
  1. **Reviewed**: the Work covered by the submittal may proceed provided it complies with the requirements of the Contract Documents.
  2. **Make Correction Noted**: the Work may proceed provided it complies with the Architect's notations or corrections on the submittal and complies with the requirements of the Contract Documents. Acceptance of the Work will depend upon these compliances.
  3. **Revise and Resubmit or Rejected**: the Work covered by the submittal (purchasing, fabrication, delivery, or other activity) should not proceed. The submittal should be revised or a new submittal resubmitted without delay, in accordance with the Architect's notations stating the reasons for returning the submittal.
  4. **Rejected** - the work covered by the submittal is not in accordance with the Contract Documents and shall not proceed. The contractor shall resubmit without delay.

#### 1.04 SUBMISSION OF SHOP DRAWINGS

- A. Shop Drawings shall be complete, give all information necessary or requested in the individual section of the specifications. They shall also show adjoining Work and details of connection thereto.
- B. Shop Drawings shall be for whole systems. Partial submissions will not be accepted.
- C. The Architect reserves the right to review and approve shop drawings only after approval of related product data and samples.
- D. Shop drawings shall be properly identified and contain the name of the project, name of the firm submitting the shop drawings, shop drawing number, date of shop drawings and revisions, Contractor's stamp of approval, and sufficient spaces near the title block for the Architect's stamp.
- E. The Contractor shall submit to the Architect one legible, reproducible transparency and two black line prints of each shop drawing. Transparency and prints shall be mailed or delivered in roll form. Each submittal shall be accompanied by a transmittal notice.
- F. When the transparency is returned by the Architect with the stamp "Revise and

Resubmit" or "Disapproved", the Contractor shall correct the original drawing or prepare a new drawing and resubmit a transparency and two prints thereof to the Architect for approval. This procedure shall be repeated until the Architect's approval is obtained.

- G. When the transparency is returned by the Architect with the stamp "Reviewed" or "Make Corrections Noted", the Contractor shall provide and distribute the prints for all Contractor and Subcontractors use, and in addition submit, within 10 calendar days after approval, 4 prints to the Architect.
- H. The Contractor shall maintain one full set of approved shop drawings at the site.

#### 1.05 SUBMISSION OF PRODUCT DATA

- A. The Contractor shall submit 7 copies of Product Data to the Architect. All such data shall be specific and identification of material or equipment submitted shall be clearly marked in ink. Data of general nature will not be accepted.
- B. Product Data shall be accompanied by a transmittal notice. The Contractor's stamp of approval shall appear on the printed information itself, in a location which will not mar legibility.
- C. Product Data returned by the Architect as "Disapproved" shall be resubmitted in 7 copies until the Architects approval is obtained.
- D. When the Product Data are acceptable, the Architect will stamp them "Reviewed" or "Make Corrections Noted ", retain 3 copies and return 4 copies to the Contractor. The Contractor shall provide and distribute additional copies as may be required to complete the Work.
- E. The Contractor shall maintain one full set of approved, original, Product Data at the site.

#### 1.06 SUBMISSION OF SAMPLES

- A. Unless otherwise specified in the individual section, the Contractor shall submit two specimens of each sample.
- B. Samples shall be of adequate size to permit proper evaluation of materials. Where variations in color or in other characteristics are to be expected, samples shall show the maximum range of variation. Materials exceeding the variation of approved samples will not be approved on the Work.
- C. Samples of items of interior finishes shall be submitted all at once to permit a coordinated selection of colors and finishes.
- D. Samples which can be conveniently mailed shall be sent directly to the Architect, accompanied by a transmittal notice. All transmittals shall be stamped with the Contractor's approval stamp of the material submitted.
- E. All other samples shall be delivered at the field office of the Project Representative with sample identification tag attached and properly filled in. Transmittal notice of samples so delivered with the Contractor's stamp of approval shall be mailed to the Architect.



- F. If a sample is rejected by the Architect, a new sample shall be resubmitted in a manner specified herein above. This procedure shall be repeated until the sample is approved by the Architect.
- G. Samples will not be returned unless return is requested at the time of submission. The right is reserved to require submission of samples whether or not particular mention is made in the specifications.

**END OF SECTION**

**SECTION 01350**  
**SUBMITTAL PROCEDURES**

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide types of submittals listed in individual sections and number of copies required below.
  - 1. Shop drawings, reviewed and annotated by the Contractor - transparency and two blackline prints. Note: at project closeout, provide two (2) complete packages consisting of all project submittals for Owner's use.
  - 2. Product data - 4 copies.
  - 3. Samples - 2, plus extra samples as required to indicate range of color, finish, and texture to be expected.
  - 4. Inspection and test reports - 4 copies.
  - 5. Warranties - 4 copies.
  - 6. Survey data - 4 copies.
  - 7. Closeout submittals - 4 copies.
- B. Comply with project format for submittals.
- C. Comply with submittal procedures established by Architect including Architect's submittal and shop drawing stamp. Provide required resubmittals if original submittals are not approved. Provide distribution of approved copies including modifications after submittals have been approved.
- D. Samples and shop drawings shall be prepared specifically for this project. Shop drawings shall include dimensions and details, including adjacent construction and related work. Note special coordination required. Note any deviations from requirements of the Contract Documents.
- E. Provide warranties as specified; warranties shall not limit length of time for remedy of damages Owner may have by legal statute. Warranties shall be signed by contractor, supplier or installer responsible for performance of warranty.

PART 2 - PRODUCTS - Not Applicable To This Section

PART 3 - EXECUTION - Not Applicable To This Section

END OF SECTION

1. SECTION 01400

**QUALITY REQUIREMENTS**

PART 1 - GENERAL

1.01 SUMMARY

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions and workmanship, to produce Work of specified quality. Provide the necessary quality control requirements for a complete and proper job.
- B. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

1.02 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate. Comply with manufacturers' tolerances.

1.03 REFERENCES

- A. For products or workmanship specified by association, trade, or other consensus standards, complies with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

1.04 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to perform the following as applicable and to initiate instructions when necessary.
  - 1. Observe site conditions.
  - 2. Conditions of surfaces and installation.
  - 3. Quality of workmanship.

1.05 CONTRACTOR'S QUALITY CONTROL

- A. Perform quality control during installation.

1.06 MOCK-UP REQUIREMENTS

- A. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals and finishes. Accepted mock-ups shall be a comparison standard for the remaining Work.
- B. Where mock-up has been accepted by Architect and no longer needed, remove mock-up and clear area when directed to do so.

1.07 VERIFICATION OF CREDENTIALS AND LICENSES

- A. Persons employed on the project site shall have appropriate and current credentials and licenses in their possession, at the project site, for the work they are performing.
- B. Owner's Representative will also be reviewing Contractor's Certified Payroll Records for conformance with Prevailing Wage Requirements.

#### 1.08 REFERENCES

- A. Conform to reference standards by date of issue.
- B. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- C. The contractual relationship, duties, and responsibilities of the parties of the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

#### 1.09 FIELD SAMPLES

- A. Install field samples at the site as required by individual specification Sections for approval.
- B. Approved samples represent a quality level for the Work.
- C. Where field sample is specified in individual Sections to be removed, clear area after field sample has been approved by Architect.

#### 1.10 MOCK-UP

- A. Assemble and erect specified items, with specified attachment and anchorage devices, flashings, seals, and finishes.
- B. Where mock-up is specified in individual Sections to be removed, clear area after mock-up has been approved by Architect.
- C. Mock-up may be actual part of specified work with the approval of the Owner and/or Architect.

#### 1.11 INSPECTION AND LABORATORY SERVICES

- A. Contractor shall appoint and employ the services of an independent firm to perform inspection and testing. Contractor shall pay for all services unless specifically stated otherwise herein.
- B. The independent firm shall perform inspections, tests, and other services specified in individual specification sections and as required by the Architect.
- C. Reports shall be submitted by the independent firm to the Architect, in duplicate, indicating observations and results of tests and indicating compliance or not-compliance with Contract Documents.
- D. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, and assistance as requested.
  - 1. Notify Architect and independent firm 24 hours prior to expected time for operations requiring services.
  - 2. Make arrangement with independent firm and pay for additional samples and tests required for Contractor's use.

- E. Contractor shall be solely responsible for retesting required because of non-conformance to specified requirements. Payment for retesting shall be charged to the Contractor by deducting inspection or testing costs from the Contract Sum. The Project Allowance(s) shall not be utilized.
- F. Where and when testing is required as an "Industry Standard Procedure" for this type of work, the cost of all testing shall be paid for by the Contractor unless otherwise noted in other sections herein. Architect's decision shall be final.

#### 1.12 MANUFACTURERS' FIELD SERVICES AND REPORTS

- A. Observer subject to approval of Architect.
- B. When specified in individual specification Sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, as applicable, and to initiate instructions when necessary.
- C. Individuals shall report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer' written instructions.
- D. Submit report in duplicate within seven (7) days of observation to Architect for review.
- E. Upon Substantial Completion of the installation, Contractor shall engage the manufacturer of the materials and equipment supplied, to review and inspect all work. Submit written report of evaluation and statement that the systems have been tested and determined to be fully functional and installed in accordance with the Construction Documents.

PART 2 - PRODUCTS - Not Applicable To This Section

PART 3 - EXECUTION - Not Applicable To This Section

END OF SECTION

## SECTION 01500

### TEMPORARY FACILITIES

#### PART 1 – GENERAL

##### 1.01 SUMMARY

- A. The Contractor shall be responsible for providing and maintaining all temporary facilities until Substantial Completion. Removal of such prior to Substantial Completion must be with the concurrence of the Architect. The Contractor bears full responsibility for providing any facility removed prior to Substantial Completion if required for the Work.

##### 1.02. FIELD OFFICES

- A. The Contractor shall provide a suitable office at the site for use by Contractor personnel.
- B. The offices shall be set in a location approved by the Owner, and shall be maintained by the Contractor in a clean and orderly condition.

##### 1.03. TEMPORARY TELEPHONES

- A. The Contractor shall provide cellular phone service for the use of the Contractor's authorized personnel and Subcontractors, and communications with Architect.
- B. The Contractor shall pay for all calls and charges in connection therewith.
- C. The building telephone shall not be used by the Contractor.

##### 1.04 TEMPORARY TOILETS

- A. The Contractor shall provide and service an adequate number of toilet booths with chemical type toilets.
- B. The toilets shall be erected in a location approved by the Owner and shall be maintained by the Contractor in a clean and orderly condition in compliance with all local and state health requirements.

##### 1.05 TEMPORARY STRUCTURES AND MATERIAL HANDLING

- A. The Contractor shall provide such storage sheds, temporary buildings, or trailers as required for the performance of the Contract.
- B. Materials shall be handled, stored, installed, cleaned, and protected in accordance with the best practice in the industry and, except where otherwise specified in the Contract Documents, in accordance with manufacturer's specifications and directions.

##### 1.06 TEMPORARY STAGING, STAIRS, CHUTES

- A. Except as otherwise specified, the Contractor shall furnish, install, maintain in safe condition, and remove all scaffolds, staging, and planking, as required for the use of all trades for proper execution of the Work.
- B. The Contractor shall furnish, install, maintain, and remove all temporary ramps, stairs, ladders, exterior glazing and similar items as required for the use of all trades for the proper execution of the Work.

#### 1.07 HOISTING FACILITIES

- A. Except as otherwise specified, the Contractor shall provide, operate, and remove material hoists, cranes, and other hoisting as required for the performance of the Work by all trades.

#### 1.08 WATER

- A. The Contractor shall provide an adequate supply of cool drinking water with individual drinking cups for personnel on the job.

#### 1.09 TEMPORARY ELECTRICITY

- A. The Contractor shall make arrangements for, and furnish and install all necessary equipment to provide temporary power for his use on a during construction.
- B. Temporary electrical Work shall be performed under the direct supervision of at least one master electrician, who will be present on the project at all times when such work is being performed.
- C. All temporary Work shall be provided in conformity with the National Electric Code, State laws, and requirements of the power company.
- D. The Contractor shall dismantle and completely remove from the project site, temporary electrical facilities upon Substantial Completion.

#### 1.10 PARKING AND ACCESS TO THE BUILDING

- A. The Owner's parking lot can be used by the Contractor or his personnel for the duration of the project.
- B. Full access to the buildings must be maintained at all times, for use by building occupants.

#### 1.11 WEATHER PROTECTION

- A. "Weather Protection" means the temporary protection of that Work adversely affected by moisture and wind. The Contractor shall furnish and install "Weather Protection" material and be responsible for all costs associated with the same.
- B. The Contractor shall assume the entire responsibility for weather protection during construction (until Substantial Completion), and shall be liable for any damage to any Work caused by failure to supply proper weather protection and proper ventilation.

- C. It is to be specifically understood that the Contractor shall do no work under any conditions deemed unsuitable by the Architect to the satisfactory execution of the Work. This provision shall not constitute any waiver, release, or lessening of the Contractor's obligation to bring the Work to Substantial Completion within the period of time set forth in the Contract Documents.

END OF SECTION



**SECTION 01550**  
**PROJECT MEETINGS**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Contractor shall schedule and administer pre-construction meetings, periodic progress meetings, and schedule meetings throughout the progress of the work.
  - 1. Prepare agenda for meetings.
  - 2. Distribute written notice of each meeting.
  - 3. Make physical arrangements for meetings.
  - 4. Preside at meetings.
  - 5. Prepare minutes of meetings unless otherwise directed in writing by the Architect.
- B. Representatives of contractors, subcontractors and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents.
- C. A/E will attend meetings to ascertain that work is expedited consistent with Contract Documents and the Construction Schedules.
- D. Related Work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.
  - 2. The Contractor's relations with his subcontractors and materials suppliers, and discussions relative thereto, are the Contractor's responsibility and normally are not part of project meetings content.

1.02 QUALITY ASSURANCE:

- A. For those persons designated by the Contractor to attend and participate in project meetings, provide required authority and commit the Contractor to solutions agreed upon in the project meetings.

1.03 SUBMITTALS:

- A. Make submittals of shop drawings, samples, substitution requests, and other items in accordance with the provisions of this section.

PART 2 – PRODUCTS:

Not Used.

## PART 3 – EXECUTION:

### 3.01 PRE-CONSTRUCTION MEETING

- A. Schedule within ten (10) calendar days after date of Purchase Order.
  - 1. Minutes:
    - a.) The Contractor shall compile minutes of each project meeting, and will furnish three copies to the Architect and required copies to the Owner.
    - b.) Recipients of copies may make and distribute such other copies as they wish.
- B. Locations: On Site. (Location to be determined)
- C. Attendance:
  - 1. Owner's Representative
  - 2. A/E and his/her professional consultants
  - 3. Resident Project Representative
  - 4. Contractor's Superintendent
  - 5. Major Subcontractors
- D. Suggested Addenda:
  - 1. Distribution and discussion of:
    - a) List of major subcontractors and suppliers.
    - b) Projected Construction Schedules
  - 2. Critical work sequencing.
  - 3. Major equipment deliveries and priorities.
  - 4. Project Coordination
    - a) Designation of responsible personnel.
  - 5. Procedures and processing of:
    - a) Field decisions
    - b) Proposal requests
    - c) Submittals
    - d) Change Orders
    - e) Applications for Payment
  - 6. Adequacy of distribution of Contract Documents.
  - 7. Procedures for maintaining Record Documents.
  - 8. Use of premises:
    - a) Office, work and storage areas.
    - b) Owner's requirements.
  - 9. Construction facilities, controls and construction aids.
  - 10. Temporary utilities.
  - 11. Safety and first-aid procedures.
  - 12. Security procedures.
  - 13. Housekeeping procedures.

### 3.02 PROGRESS MEETINGS:

- A. Schedule regular periodic meetings, as required.
- B. Hold called meetings as required by progress of work.
- C. Location of Meetings: The project field office of the Contractor or other location as determined necessary.

D. Attendance:

1. Owner, Contractor, A/E and his professional consultants as needed or when requested by the Owner.
2. Subcontractors as appropriate to the agenda.
3. Suppliers as appropriate to the agenda.
4. Others.

E. Suggested Agenda:

1. Review, approval of minutes of previous meeting.
2. Review of work progress since previous meeting.
3. Field observations, problems, conflicts.
4. Problems which impede Construction Schedule.
5. Review of off-site fabrication, delivery schedules.
6. Corrective measures and procedures to regain projected schedule.
7. Revisions to Construction Schedule.
8. Plan progress, schedule, during succeeding work period.
9. Coordination of schedules.
10. Review submittal schedules; expedite as required.
11. Maintenance of quality standards.
12. Life/safety issues.

END OF SECTION

**SECTION 01600**  
**PRODUCT REQUIREMENTS**

**PART 1 - GENERAL**

1.01 SUMMARY

- A. Provide products from one manufacturer for each type or kind as applicable. Provide secondary materials as acceptable to manufacturers of primary materials.
- B. Provide products selected or equal approved by Architect. Products submitted for substitution shall be submitted with complete documentation and include construction costs of substitution including related work.
- C. Request for substitution must be in writing. Conditions for substitution include:
  - 1. An 'or equal' phrase in the specifications.
  - 2. Specified material cannot be coordinated with other work.
  - 3. Specified material is not acceptable to authorities having jurisdiction.
  - 4. Substantial advantage is offered to the Owner in terms of cost, time, or other valuable consideration.
- D. Substitutions shall be submitted prior to the opening of bids, unless otherwise deemed acceptable in writing. Approval of shop drawings, product data, or samples containing substitutions is not an approval of a substitution unless items are clearly presented as a substitution at the time of submittal.
- E. In making request for substitution, Bidder/Contractor represents:
  - 1. He has personally investigated proposed product or method, and determined that it is equal or superior in all respects to that specified.
  - 2. He will provide the same guarantee for substitution as for product or method specified.
  - 3. He will coordinate installation of accepted substitution into work, making such changes as may be required for work to be complete in all respects.
  - 4. He waives all claims for additional costs related to substitution which consequently becomes apparent.
  - 5. Cost data is complete and includes all related costs under his/her Contract, but excludes:
    - a) Costs under separate contracts.
    - b) Architect/Engineer's redesign.

**PART 2 - PRODUCTS** - Not Applicable To This Section

**PART 3 - EXECUTION** - Not Applicable To This Section

END OF SECTION

**SECTION 01630**

**WARRANTY**

PART 1 - GENERAL

1.01 SUMMARY

- A. The Contractor shall submit a written warranty covering his work for a period of one (1) year. All warranties shall go into effect on the date of **Substantial** completion.
  
- B. Refer to the General Conditions of the Contract for Construction for additional information.

**PART 2 - PRODUCTS** - Not Applicable To This Section

**PART 3 - EXECUTION** - Not Applicable To This Section

END OF SECTION

## SECTION 01660

### CLEANING UP

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. Work Included: Throughout the construction period, maintain the building and site in a standard of cleanliness as described in this Section.
- B. Related Work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
  - 2. In addition to standards described in this Section, comply with requirements for cleaning as described in pertinent other sections of these specifications.

##### 1.02 QUALITY ASSURANCE:

- A. Conduct daily inspection, and more often if necessary, to verify that requirements for cleanliness are being met.
- B. In addition to the standards described in this section, comply with pertinent requirements of governmental agencies having jurisdiction.

##### 1.03 RESPONSIBILITIES OF THE CONTRACTOR:

- A. The General Contractor shall be responsible for the work of this Section, however, each subcontractor engaged upon the work shall bear his/her full responsibility in cleaning up immediately each day upon completion of his work in accordance with the provisions of this Section or other applicable Sections of the Specifications and shall cooperate with the Contractor to that effect.
- B. The above shall in no way be construed to relieve the Contractor of his responsibility for leaving all work in a clean and proper condition, satisfactory to the Owner and the A/E.

##### 1.04 REQUIREMENTS OF REGULATORY AGENCIES:

- A. Safety Standards: Maintain project in accordance with the following safety and insurance standard: Federal Occupational Safety and Health Act - Latest Edition.
- B. Fire Protection: Store volatile waste in approved metal containers, and remove from premises daily.
- C. Pollution Control: Conduct clean-up and disposal operations to comply with local ordinances and anti-pollution laws.
  - 1. Burning or burying of rubbish and waste materials on project site is not permitted.
  - 2. Disposal of volatile fluid wastes (such as mineral spirits, oil or paint thinner) in storm sanitary sewer systems or into streams or waterways is not permitted.

#### PART 2 - PRODUCTS: CLEANING MATERIALS

- A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

- B. Use cleaning materials only on surfaces recommended by cleaning materials manufacturer.

### PART 3 - EXECUTION

#### 3.01 DURING CONSTRUCTION:

- A. Oversee cleaning and insure that building and grounds are maintained free from accumulations of waste material and rubbish.
- B. Sprinkle dusty debris with water and calcium chloride as needed. Calcium chloride shall be utilized only as directed by the Architect.
- C. At reasonable intervals daily, during the progress of work, clean-up site and access and dispose of waste materials, rubbish and debris.
- D. Do not allow waste material, rubbish and debris to accumulate and become an unsightly or hazardous condition.
- E. Remove waste materials, rubbish and debris from the site and legally dispose of at public or private dumping areas off the Owner's property.
- F. Vacuum clean interior building areas when ready to receive finish painting and continue vacuum cleaning on an as-needed basis until building is ready for acceptance or occupancy.
- G. Lower waste materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.
- H. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet newly painted surfaces.

#### 3.02 FINAL CLEANING:

- A. Use experienced workmen, or professional cleaners for final cleaning.
- B. At completion of construction and just prior to acceptance or occupancy, conduct a final inspection of exposed exterior and interior surfaces.
- C. Remove grease, dust, dirt, stains, labels, fingerprints and other foreign materials from interior and exterior surfaces.
- D. Repair, patch and touch-up marred surfaces to match adjacent surfaces.
- E. Broom clean paved surfaces; rake clean other surfaces of grounds, daily.
- F. Replace air conditioning filters if units were operated during construction.
- G. Clean ducts, blowers and coils if air conditioning units were operated without filters during construction.
- H. Maintain cleaning until the building or portion thereof is occupied by the Owner.

END OF SECTION

## **SECTION 01670**

### **PROTECTION**

#### **PART 1 - GENERAL**

##### **SUMMARY**

- A. Any damage to buildings, roads, public roads, bituminous concrete areas, fences, lawn areas, trees, shrubbery, poles, underground utilities, etc. shall be made good by and at the Contractor's own expense, all to the satisfaction of the Owner. The Contractor shall patch, repair and/or replace all adjacent materials and surfaces damaged after the installation of new work at no expense to the Owner. All repair and replacement work shall match the existing in kind and appearance.

**PART 2 - PRODUCTS** - Not Applicable To This Section

**PART 3 - EXECUTION** - Not Applicable To This Section

**END OF SECTION**



**SECTION 01700**  
**EXECUTION REQUIREMENTS**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. The following are prerequisites to substantial completion. Provide the following:
  - 1. Punch list prepared by Contractor and subcontractors as applicable.
  - 2. Supporting documentation.
  - 3. Warranties.
  - 4. Certifications.
- B. Provide the following prerequisites to final acceptance:
  - 1. Final payment request with supporting affidavits.
  - 2. Completed punch list.
- C. Provide a marked-up set of drawings including changes which occurred during construction.
- D. Provide the following during project closeout:
  - 1. Submission of record documents.
  - 2. Submission of maintenance manuals.
  - 3. Removal of temporary facilities.

**PART 2 - PRODUCTS - Not Applicable To This Section**

**PART 3 - EXECUTION - Not Applicable To This Section**

**END OF SECTION**

**SECTION 01711**  
**DEMOLITION AND REPAIR**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: Carefully demolish and remove from the building and site those items specified to be demolished and removed. Provide patching and repairs to all surfaces as indicated and as required for a complete and proper job.
- B. Demolition shall not begin within the construction area or any other portions of the job site until all materials needed to complete the affected areas have been delivered to the job site.
- C. Scope: The demolition and repair work generally consists of, but is not necessarily limited to that work described and shown on the drawings:
  - 1. The work of this section also consists of, but is not necessarily limited to that work described in Section 01100, Summary of the Work and elsewhere herein.
- D. Related Work:
  - 1. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these specifications.
  - 2. Section 01740: Cutting and Patching.

1.02 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Match existing materials unless otherwise specified.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS:

- A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 DEMOLITION

- A. By careful study of the Contract Documents, determine the location and extent of selective demolition and repairs to be performed.

- B. Prepare and follow an organized plan for demolition and removal of items:
  - 1. Shut off, cap, and otherwise protect existing utility lines.
  - 2. Completely remove items scheduled to be so demolished and removed, leaving surfaces clean, solid, and ready to receive new materials specified elsewhere.
  - 3. Where indicated on the drawings, completely remove footings, foundations, and above-ground and under-ground construction of all kinds.
  - 4. In all activities, comply with pertinent regulations of governmental agencies having jurisdiction.
- C. The Contractor shall be responsible for the removal and disposal of all materials and equipment from the site and building during the project. Unless directed otherwise by the Owner, all demolition materials to be removed from the site shall be disposed of in accordance with applicable laws and regulations.
- D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- E. Demolished material shall be considered to be the property of the Contractor unless Owner otherwise directs Contractor, and shall be completely removed from the job site. The Contractor shall, prior to any removal of rubbish from the site, furnish written evidence satisfactory to the Architect and/or Owner, that he has disposed of all debris from his demolition in an approved dumping location. **Owner shall have first right of refusal of any and all materials and equipment scheduled for removal.**
- F. All demolition work shall be carried on in such a manner that the existing building and site and their component parts will not be damaged. Any damage to the building shall be corrected by the Contractor, to the satisfaction of the Owner and Architect, at no additional cost to the Owner.
- G. Demolition of any of the material to be removed shall be carefully scheduled so that no portion of the buildings shall remain unprotected from the weather when work is not in progress. The Contractor and/or Subcontractor shall have on hand at all times, temporary covers and other materials to make weather tight areas that may be without protection in the event of a sudden shower, snowfall, freezing weather, etc.

### 3.02 REPLACEMENTS

- A. In the event of demolition of items not so scheduled to be demolished, promptly replace such items to the approval of the Architect and at no additional cost to the Owner.

### 3.03 CUTTING, PATCHING, REPAIR

- A. Patch and repair all surfaces damaged as a result of the work of this Contract. When completed, patches or repairs shall not be visible to the naked eye from a distance of 6 feet.

END OF SECTION

**SECTION 01720**  
**PERMITS AND FEES**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. The Contractor shall apply for, obtain and pay for all required permits and fees and shall arrange and schedule all inspections required.
- B. No work shall begin until all pertinent permits are obtained.
- C. The building permit shall be posted in a location that is protected from the weather and clearly visible from the exterior of the building.
- D. The Contractor shall submit a copy of the building permit to the Architect and Owner.

**PART 2 - PRODUCTS - Not Applicable To This Section**

**PART 3 - EXECUTION - Not Applicable To This Section**

END OF SECTION

**SECTION 01740**  
**CUTTING AND PATCHING**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Provide cutting and patching work to properly complete the work of the project, complying with the applicable project requirements for:
  - 1. Structural work.
  - 2. Mechanical/Electrical Systems.
  - 3. Visual requirements, including detailing and tolerances.
  - 4. Operational and safety limitations.
  - 5. Fire-resistance ratings.
  - 6. Inspection, preparation, and performance.
  - 7. Cleaning.
- B. Do not cut and patch in a manner that would result in a failure of the work to perform as intended, decrease energy performance, increase maintenance, decrease operational life, or decrease safety performance.

**PART 2 - PRODUCTS**

**2.01 MATERIALS**

- A. Match existing materials for cutting and patching work with new materials conforming to project requirements.

**PART 3 – EXECUTION**

**3.01 INSPECTION**

- A. Inspect existing conditions of the Project, including elements subject to damage or to movement during cutting and patching.
- B. After uncovering work, inspect the conditions affecting the installation of products, or performance of the work.
- C. Report unsatisfactory or questionable conditions to the A/E in writing; do not proceed with the work until the A/E has provided further instructions.

**3.02 PREPARATION:**

- A. Provide adequate temporary support as necessary to assure the structural value or integrity of the affected portion of the work.
- B. Provide devices and methods to protect other portions of the project from damage.
- C. Provide protection from the elements for that portion of the project which may be exposed by cutting and patching work and maintain excavations free from water.

3.03 PERFORMANCE:

- A. Execute cutting and demolition by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.
- B. Execute excavating and backfilling by methods which will prevent settlement or damage to other work.
- C. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.
- D. Restore work which has been cut or removed; install new products to provide completed work in accord with requirements of Contract Documents.
- E. Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
- F. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes.
  - 1. For continuous surfaces, refinish to nearest intersection.
  - 2. For an assembly, refinish the entire unit.

END OF SECTION

## SECTION 01760

### SURVEYS AND RECORD DRAWINGS

#### PART 1 - GENERAL

##### 1.02 RECORD DRAWINGS

- A. Record Drawings shall consist of all the Contract Drawings.
- B. From the sets of drawings furnished by the Owner, the Contractor shall reserve one set for record purposes. From this set, the Contractor shall detach and furnish, at no charge to the Mechanical and Electrical Subcontractors the drawings of their portion of the Work for the same purpose.
- C. The Contractor and the above Subcontractors shall keep their record set on the site at all times and note on it in colored ink or pencil, neatly and accurately, at the end of each working day, the exact location of their work as actually installed. This shall include the location and dimensions of underground and concealed Work and any architectural, mechanical, or electrical variations from the Contract Drawings. All changes, including those issued by Addendum, Change Order, or instructions by the Architect shall be recorded. Record Drawings shall be prepared for the entire project and include all Work.
- D. The Architect may periodically inspect the Record Drawings at the site. The proper and current maintenance of the information required on these drawings shall be a condition precedent to approval of the monthly requisitions for periodic payment.
- E. At Substantial Completion the Contractor shall submit the complete set of Record Drawings to the Architect. The Architect will review these drawings and return them to the Contractor with necessary comments.
- F. Upon receipt of a set of electronic media files of the original contract drawings from the Architect, the Contractor and Subcontractors shall transfer the As-Built information shown on the Record Drawings. This drafting shall be done by an experienced draftsman and match the original drawings.
- G. The Contractor shall, at its own expense, prepare two sets of prints and then submit copies of the prints to the Architect. Each sheet shall be clearly marked "Record Drawing" and bear the date of printing. Submission of accurate Record Drawings and their approval by the Architect shall be a condition precedent to final payment.

END OF SECTION

**SECTION 01780**  
**PROJECT CLOSEOUT**

**PART 1 – GENERAL**

**1.01 SUMMARY**

- A. This section supplements the General Conditions.
- B. Consult the individual sections of the specifications for specific items required under those sections.

**1.02 DESCRIPTION:**

- A. Work Included: Provide an orderly and efficient transfer of the completed work to the Owner.
- B. Related Work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
  - 2. Activities relative to contract closeout are described in, but not necessarily limited to the General Conditions.
  - 3. "Substantial Completion" is defined in the General Conditions, and herein.

**1.03 QUALITY ASSURANCE:**

- A. Prior to requesting inspection by the Architect, use adequate means to assure that the work is completed in accordance with the specified requirements and is ready for the requested inspection.

**1.04 OCCUPANCY PERMIT (as applicable)**

- A. The Contractor shall coordinate the efforts of all Subcontractors and obtain the Completion Certificate from the local Building Department, as required by the Building Official. The Contractor shall pay any Building Department fee associated with the Occupancy Permit.

**1.05 RECORD DRAWINGS**

- A. Consult the individual sections of the Specifications for the specific requirements of those sections. In cases of inconsistency the more stringent requirement, as directed by the Architect, shall be required.
- B. Prior to final payment and completion the Contractor shall provide all Record Drawings and media (CDs, flash drives, etc.) as required under other sections of the Specifications.

**1.06 OPERATING AND MAINTENANCE INSTRUCTIONS**

- A. Prior to final payment and completion the Contractor shall provide all Maintenance Instructions as required by the Contract Documents.
- B. Consult the individual sections of the specifications for the specific requirements for those



sections and for further details and descriptions of the requirements.

C. OPERATING INSTRUCTIONS AND MANUALS

1. Subcontractors, installers and suppliers shall furnish to the Contractor two sets of operating and maintenance instructions of all mechanical, electrical and manually operated equipment furnished and installed by them. Mechanical and electrical Subcontractors shall furnish instructions as specified in their respective sections.
2. The Contractor shall collect all of the above instructions, bind them into two complete sets and submit them to the Architect who will deliver them to the Owner.
3. Submission of operating and maintenance instructions shall be a condition precedent to final payment.

A. INSTRUCTION OF OWNER'S PERSONNEL.

1. Where specified in the individual sections of the specifications, the Contractor and Subcontractor shall instruct the Owner's personnel at the site, in the use and maintenance of equipment installed under the Contract.
2. Submission to the Architect of a certificate of compliance to this requirement, signed by the Contractor and the Owner's Representative, shall be a condition precedent to final payment.

1.08 SUBSTANTIAL COMPLETION:

A. When Contractor considers the work is substantially complete, he shall submit to A/E:

1. A written notice that the work, or designated portion thereof is substantially complete.
2. A list of items to be completed or corrected.

B. Within a reasonable time after receipt of such notice, A/E will make an inspection to determine the status of completion.

C. Should A/E determine that the work is not substantially complete:

1. A/E will promptly notify the Contractor in writing, giving reasons thereof.
2. Contractor shall remedy the deficiencies in the work and send a second written notice of substantial completion to the A/E.
3. A/E will re-inspect the work.

D. When A/E concurs that the work is substantially complete he will:

1. Prepare a Certificate of Substantial Completion, accompanied by Contractor's list of items to be completed or corrected, as verified and amended by the A/E.

1.09 FINAL INSPECTION:

A. When Contractor considers the work is complete, he shall submit written certification that:

1. Contract Documents have been reviewed.
2. Work has been inspected for compliance with Contract Documents.

3. Work has been completed in accordance with Contract Documents.
  4. Equipment and systems have been tested in the presence of the Owner's representative and are operational.
  5. Work is completed and ready for final inspection.
- B. A/E will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.
- C. Should A/E consider that the work is incomplete or defective:
1. A/E will promptly notify the Contractor in writing, listing the incomplete or defective work.
  2. Contractor shall take immediate steps to remedy the stated deficiencies and send a second written certification to A/E that the work is complete.
  3. A/E will re-inspect the Work.
- D. When the A/E finds that the work is acceptable under the Contract Documents, he shall request the Contractor to make closeout submittals.

1.10 RE-INSPECTION FEES:

- A. Should A/E perform re-inspections due to failure of the work to comply with the claims of status of completion made by the Contractor, and site visits are required in addition to those noted previously under Substantial Completion and Final Inspection:
1. Contractor shall compensate A/E for such additional services. A/E fees shall be charged to the General Contractor at the A/E standard hourly rate of \$175.00/hr.
  2. Processing of Final Payment to the Contractor will not be completed until full payment for additional A/E Services is made by the Contractor to the Architect.

1.11 CONTRACTOR'S CLOSEOUT SUBMITTALS AND PROCEDURES:

- A. Provide submittals to Architect that are required by governing or other authorities, including the following closeout documents. Six (6) originally executed copies of all documentation shall be submitted. **Note: these items must be submitted prior to issuance of the Final Application for Payment.**
1. AIA Document G706 - Contractor's Affidavit of Payment of Debts and Claims, latest Edition.
  2. AIA Document G706A - Contractor's Affidavit of Release of Liens, latest Edition.
  3. AIA Document G707 - Consent of Surety Company to Final Payment, latest Edition.
  4. Contractor's Certificate and Release (Architect to provide Contractor with form for Contractor to complete and return to Architect)
  5. Certificate of Completion-Consolidated (completed by Architect)
  6. Contractor's (2)-year Warrantee statement
  7. Two (2) set As-Built Drawings, per Section 01760 herein
  8. Two (2) sets of submittals, per Section 01330 herein
- B. Submit Final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

- C. Convey fully corrected and updated set of Project Record Documents to Architect with Final Application for Payment.
- D. Evidence of compliance with requirements of governing authorities:
  - 1. Certificate of Occupancy.
- E. Final Completion will be considered only when Architect has approved and accepted possession of required closeout documents, and has determined closeout procedures are completed.
- F. Operating and Maintenance Data, Instructions to Owner's Personnel.
- G. Warranties and Bonds.
- H. Approved project submittals and shop drawings
- I. As-built drawings
- J. Spare Parts and Maintenance Materials.

1.12 FINAL ADJUSTMENT OF ACCOUNTS:

- A. Submit a final statement of accounting to the Architect.
- B. Statement shall reflect all adjustments to the Contract Sum:
  - 1. The original Contract Sum.
  - 2. Additions and deductions resulting from:
    - a) Previous Change Orders.
    - b) Allowances.
    - c) Unit Prices.
    - d) Deductions for uncorrected work.
    - e) Penalties and Bonuses.
    - f) Deduction for liquidated damages.
    - g) Deductions for re-inspection payments.
    - h) Other adjustments.
  - 3. Total Contract Sum, as adjusted.
  - 4. Previous payments.
  - 5. Sum remaining due.
- C. The Architect will prepare a final Change Order reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

1.13 FINAL APPLICATION FOR PAYMENT:

- A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the Provisions of the Contract.
- B. See 1.09 regarding inspection fees, preceding.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION

**SECTION 03500**  
**CONCRETE SPALL**  
**(HORIZONTAL & VERTICAL, DEEP) REPAIRS**

PART 1 – GENERAL

1.01 Summary

- A. This specification describes the patching of concrete surfaces with portland cement concrete.

1.02 Quality Assurance

- A. Manufacturing qualifications: The manufacturer of the specified product shall be ISO 9001/9002 certified and have in existence a recognized ongoing quality assurance program independently audited on a regular basis.
- B. Contractor qualifications: Contractor shall be qualified in the field of concrete repair and protection with a successful track record of 5 years or more. Contractor shall maintain qualified personnel who have received product training by a manufacturer's representative
- C. Install materials in accordance with all safety and weather conditions required by manufacturer or as modified by applicable rules and regulations of local, state and federal authorities having jurisdiction. Consult Material Safety Data Sheets for complete handling recommendations.

1.03 Delivery, Storage, and Handling

- A. All materials must be delivered in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers. Damaged material must be removed from the site immediately.
- B. Store all materials off the ground and protect from rain, freezing or excessive heat until ready for use.
- C. Condition the specified product as recommended by the manufacturer.

1.04 Job Conditions

- A. Environmental Conditions: Do not apply material if it is raining or snowing or if such conditions appear to be imminent. Minimum application temperature 45°F (7°C) and rising.
- B. Protection: Precautions should be taken to avoid damage to any surface near the work zone due to mixing and handling of the specified material.

1.05 Submittals

- A. Submit two copies of manufacturer's literature, to include: Product Data Sheets, and appropriate Material Safety Data Sheets (MSDS).

1.06 Warranty

- A. Provide a written warranty from the manufacturer against defects of materials for a period of one (1) year, beginning with date of substantial completion of the project.

## PART 2 - PRODUCTS

### 2.01 Manufacturer

- A. As a basis of design, SikaQuick 1000, as manufactured by Sika Corporation, is considered to conform to the requirements of this specification, or one of the following manufacturers that meet or exceed the requirements of these specifications:
1. BASF
  2. Conproco

### 2.02 Materials

- A. Portland cement mortar:
1. The repair mortar shall be a blend of selected portland cements, specially graded aggregates, admixtures for controlling setting time, water reducers for workability, and an organic accelerator.
  2. The materials shall be non-combustible, both before and after cure.
  3. The materials shall be supplied in a factory-proportioned unit.
  4. The portland cement mortar must be placeable from 1/4" to 2" in depth per lift for horizontal applications.
- B. To prepare a rapid-setting portland cement concrete: aggregate shall conform to ASTM C-33. The material shall be extended with 25-lb. of a 3/8 in. ( No.8 distribution per ASTM C-33, Table II) clean, well-graded, saturated surface dry aggregate, having low absorption, high density and non-reactive (reference ASTM C1260, C227, C289). Aggregate must be approved for use by the Engineer.

### 2.03 Performance Criteria

Typical Properties of the material:

1. Working Time: Approximately 30 minutes
2. Color: concrete gray

B. Typical Properties of the cured material (mortar):

1. Compressive Strength (ASTM C-109)
  - a. 3 hours: 1,250 psi (8.6 MPa)
  - b. 1 day: 4,000 psi min. (27.6 MPa)
  - d. 7 day: 5,000 psi min. (34.5 MPa)
  - f. 28 day: 7,000 psi min. (48.2 MPa)
2. Flexural Strength (ASTM C-78) @ 28 days: 1,000 psi (6.9 MPa)
3. Splitting Tensile Strength (ASTM C-496) @ 28 days 500 psi (3.4 MPa)
4. Bond Strength (ASTM C-882 Modified) @ 28 days: 2,500 psi (17.2 MPa)
5. The portland cement mortar shall not produce a vapor barrier.
6. Density (wet mix): approximately 136 lbs. / cu. ft. (2.18 kg/l)
7. Permeability (ASTM C-1202) @ 28 days Approximately <1000 Coulombs
8. Drying Shrinkage, (ASTM C596) @ 28 days: 0.06%
9. Freeze/Thaw resistance (ASTM C666) @ 28 days: 98%

## PART 3 – EXECUTION

### 3.01 Surface Preparation

- A. Areas to be repaired must be clean, sound, and free of contaminants. All loose and deteriorated concrete shall be removed by mechanical means. Mechanically prepare the concrete substrate to obtain a surface profile of +/- 1/8" (CSP 6 or greater as per ICRI Guidelines) with a new exposed aggregate surface. Area to be patched shall not be less than 1/4" in depth.
- B. Where reinforcing steel with active corrosion is encountered, sandblast the steel to a white metal finish to remove all contaminants and rust. Where corrosion has occurred due to the presence of chlorides, the steel shall be high pressure washed after mechanical cleaning. Prime steel with 2 coats of Sika Armatec 110 EpoCem as directed by manufacturer. (See Spec Component SC-201-0699)

### 3.02 Mixing and Application

- A. Mechanically mix in appropriate sized mortar mixer or with a Sika jiffy paddle and low speed (400-600 rpm) drill. Pour approximately 5 pints of water into the mixing container. Add the powder while continuing to mix. Mix to a uniform consistency for a maximum of three minutes. Add up to another ½ pint of water to mix if a greater flow is desired. Should smaller quantities be needed, be sure the proper water/powder ratio is maintained and that the dry material is uniformly blended before mixing the components together. Mix only that amount of material that can be placed in 30 minutes. Do not retemper material.
- B. Mixing of the rapid-setting portland cement concrete: Pour 5 to 5 1/2 pints of water into the mixing container. Add the powder while continuing to mix. Add correct amount of the pre-approved coarse aggregate, and continue mixing to a uniform consistency. Mixing time should be 3 minutes maximum.
- C. Placement Procedure: At the time of application, the substrate should be saturated surface dry with no standing water. Mortar and/or concrete must be scrubbed into substrate filling all pores and voids. While the scrub coat is still plastic, force material against edge of repair, working toward center. After filling, consolidate, then screed. Allow mortar or concrete to set to desired stiffness, then finish with a trowel for a smooth surface. Broom or burlap drag for rough surface. Areas where the depth of the repair is less than 2-inch shall be repaired with the neat rapid setting portland cement mortar. In areas where the depth of the repair is greater than 2 inch, the repair shall be made with the rapid-setting portland cement concrete.
- D. As per ACI recommendations for portland cement concrete, curing is required. Moist cure with wet burlap and polyethylene, a fine mist of water or a water-based\* compatible curing compound. Moist curing should commence immediately after finishing and continue for 48 hours. Protect newly applied material from rain, sun, and wind until compressive strength is 70% of the 28-day compressive strength. To prevent from freezing cover with insulating material. Setting time is dependent on temperature and humidity.  
\*Pretesting of curing compound is recommended.
- E. Adhere to all procedures, limitations and cautions for this product in the manufacturers current printed technical data sheet and literature.

### 3.03 Cleaning

- A. The uncured material can be cleaned from tools with water. The cured cement mortar can only be removed mechanically.
- B. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.

END OF SECTION

## SECTION 05500

### METAL FABRICATIONS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. Work included: Provide metal fabrication work where shown on the drawings, as specified herein, and as needed for a complete and proper installation. Work generally includes:
1. Fasteners
  2. Miscellaneous metal materials and accessories

##### 1.02 QUALITY ASSURANCE:

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Perform shop and/or field welding required in connection with the work of this Section in strict accordance with pertinent recommendations of the American Welding Society.

##### 1.03 SUBMITTALS:

- A. Comply with pertinent provisions of Section 01 30 00.

##### 1.04 PRODUCT HANDLING:

- A. Comply with pertinent provisions of Section 01 60 00.

##### 1.05 FIELD CONDITIONS:

- A. Field Measurements: verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

#### PART 2 - PRODUCTS

##### 2.01 MATERIALS (General)

- A. In fabricating items which will be exposed to view, limit materials to those which are free from surface blemishes, pitting, rolled trade names, and roughness.
- B. Comply with the following standards, as pertinent:

ASTM A36	- Steel plates, shapes and bars
ASTM A283	- Grade C - Steel plates to be bent or cold-formed
ASTM A501	- Steel tubing (hot formed, welded or seamless)
ASTM A306	- Grade 65 or ASTM A36 - Steel bars and bar size shapes
ASTM A108	- Cold finished steel bars
ASTM A336	- Cold rolled carbon steel sheets
ASTM A526	- Galvanized carbon steel sheets
ASTM A525	- (with G90 zinc)
AISI	- Type 302, A 653, Grade 33, or 304 - 22 ga. with No. 4 finish unless otherwise specified on the drawings or herein.



ASTM A53	- Gray iron castings, Grade A, Sched. 40; black finish unless otherwise noted.
ASTM A47	- Malleable iron castings
ASTM A53	- Steel pipe, Grade A, Sched. 40; black finish unless otherwise noted.
ASTM F1554	-Carbon steel, Grade 36, hot-dip-galvanized

## 2.02 FASTENERS:

### A. General:

1. Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
  - a. Provide stainless steel fasteners for fastening stainless steel
  - b. Use compatible fastening materials. Use only hot-dipped galvanized metal, copper or stainless steel fasteners where used in conjunction with preservative-treated wood.
  - c. For roof sheathing, provide fasteners with hot-dip galvanized coating complying with ASTM A153/A153M

### B. Comply with the following standards as pertinent:

1. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, where indicated, flat washers.
2. Screws for Fastening Plywood Sheathing to Wood Framing: 4d hot-dip galvanized.
3. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.
4. Post-Installed Anchors: Chemical anchors.
  - a. Material for Exterior Locations and Where Stainless Steel Is Indicated: Group 2 (A4) stainless steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).
  - b. 3/8-inch diameter, threaded anchor rod, zinc-plated
  - c. Modular composite mesh sleeve

## 2.03 MISCELLANEOUS MATERIALS AND ACCESSORIES:

- A. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Clean surfaces in accordance with Steel Structures Painting Council Sp-3, "Power Tool Cleaning".
- D. After surfaces are properly cleaned, apply the primer to a uniform 1.5 mils. dry thickness.

2.04 OTHER MATERIALS:

- A. All other materials as needed for a complete and proper installation.

2.05 FABRICATION:

- A. Except as otherwise shown on the drawings or the approved shop drawings, use materials or size, thickness and type required to produce reasonable strength and durability in the work of this section.
- B. Fabricate with accurate angles and surfaces which are true to the required lines and levels, grinding exposed welds smooth and flush, forming exposed connections with hairline joints and using concealed fasteners wherever possible.
- C. Prior to shop painting or priming, properly clean metal surfaces as required for the applied finish for the proposed use of the item.
- D. On surfaces inaccessible after assembly or erection, apply two coats on the specified primer. Change color of second coat to distinguish it from the first.
- E. Galvanizing where indicated or specified shall be performed after fabrication. Shapes, plates and bars shall be galvanized in accordance with the requirements of "Standard Specifications for the Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strips" ASTM Designation A 123-71. Nuts, bolts, and washers shall be galvanized in accordance with the requirements of "Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware" ASTM Designation A 153-71 and A286. All galvanized material shall comply with specifications and marked with stamp indicating ASTM number and weight of zinc coating in ounces per square foot similar to Duncan Stamp. Notarized statement of compliance with list of galvanized items to accompany shipment of galvanized materials and furnished to A/E.
- D. Dissimilar Material: Where aluminum surfaces come in contact with metals other than stainless steel, zinc, white bronze of small area or other metals compatible with aluminum, aluminum surfaces shall be kept from direct contact with such parts by painting the dissimilar metal with a coating of zinc chromate paint, a good quality caulking placed between aluminum and dissimilar metal, or a non-absorptive tape or gasket.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 COORDINATION:

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this section.

3.03 INSTALLATION:

- A. General:

1. Set work accurately into position, plumb, level, true and rack-free.
  2. Anchor firmly into position.
  3. Where field welding is required, comply with AWS recommended procedures of manual-shielded metal-arc welding for appearance and quality of weld and for methods to be used in correcting welding work.
  4. Grind exposed welds smooth and touch-up shop prime coats.
  5. Do not cut, weld or abrade surfaces which have been hot-dip galvanized after fabrication and which are intended for bolted or secreted field conditions.
- B. Immediately after erection, clean the field welds, bolted connections, and abraded areas of shop priming. Paint the exposed areas with the same materials used for shop priming.
- 3.04 CLEANUP:
- A. Upon completion of this section of work, remove all protective wraps and debris. Repair any damage due to installation of this section of work.
- 2.05 PROTECTION:
- A. During installation, it shall be the responsibility of the installer to protect this work from damage.

END OF SECTION

## SECTION 06100

### ROUGH CARPENTRY

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. Work Included: Provide wood, nails, bolts, screws, framing anchors, rough hardware, and other such items needed to perform rough carpentry for the construction shown on the drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work:
  - 1. Documents affecting work of this section including but not necessarily limited to General Conditions, Supplementary Conditions, and sections in Division 1 of these Specifications.

##### 1.02 QUALITY ASSURANCE:

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. Lumber Grading Rules and Wood Species to be in conformance with Voluntary Product Standard PS 20-70. Grading Rules of the following associations apply to materials furnished under this section.
  - 1. Northeastern Lumber Manufacturer's Association, Inc. (NELMA)
  - 2. Southern Pine Inspection Bureau (SPIB)
  - 3. West Coast Lumber Inspection Bureau (WCLIB)
  - 4. Western Wood Products Association (WWPA)
  - 5. Redwood Inspection Service (RIS)
  - 6. Northern Hardwood and Pine Manufacturer's Association (NHPMA)
- C. Plywood Grading Rules:
  - 1. Softwood plywood/Construction and Industrial: Product Standard PS 1-66
- D. Grade Marks: Identify all lumber and plywood by official grade marks.
  - 1. Lumber: Grade stamp to contain symbol of grading agency, mill number or name, grade of lumber, species or species grouping or combination designation, rules under which graded, where applicable and condition of seasoning at time of manufacture.
    - a) S-GRN: Unseasoned
    - b) S-Dry: Maximum 19% moisture content
    - c) MC-15 or KD: Maximum of 15% moisture content
    - d) Dense.
  - 2. Softwood Plywood: Appropriate grade trademark of the American Plywood Association.
    - a) Type, grade, class, and identification index.
    - b) Inspection and testing agency mark.
- E. Testing: ASTM E 84-70, maximum 25 flame spread rating (exposed wood only).
- F. All Lumber: Preservative treated or fire retardant, as directed on the drawings and herein.

G. Requirements of Regulatory Agencies:

1. Fire Hazard Classification: Underwriters' Laboratories, Inc., for treated lumber and plywood.
2. Preservative Treated Lumber and Plywood: American Wood Preserver Bureau, Quality mark.
3. Pressure Treated Material: American Wood Preservers Bureau Standards.
4. Span Tables: National Forest Products Associations.
5. Working Stresses: Softwood Lumber, National Design Specification, National Forest Products Association.

1.03 SUBMITTALS

A. Certification:

1. Preservation Treated Wood: Submit certification for waterborne preservative that moisture content was reduced to 19% maximum, after treatment.
2. Fire-retardant Treatment: Submit certification of treating plant that fire-retardant treatment materials comply with governing ordinances and that treatment will not bleed through finished surfaces.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Immediately upon delivery to job site, place materials in area protected from weather.
- B. Store materials a minimum of 6" above ground on framework or blocking and cover with protective waterproof covering providing for adequate air circulation or ventilation.
- C. Do not store seasoned materials in wet or damp portions of building.
- D. Protect fire-retardant materials against high humidity and moisture during storage and erection.
- E. Protect sheet materials from corners breaking and damaging surfaces while unloading.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide materials in the quantities needed for the work shown on the drawings, and meeting or exceeding the following standard of quality:
- B. Lumber:
  1. Lumber: PS 20; graded in accordance with established Grading rules.
    - a) Structural Light Framing: Southern Yellow Pine No. 2 grade and better.
    - b) Non-structural Light Framing: Southern Yellow Pine No. 2 grade and better.
    - c) Horizontal framing members: Southern Yellow Pine, Table 1, Construction grade.
    - d) Vertical framing members: Southern Yellow Pine, Table 1, Standard grade.
  2. Dimensions:
    - a) Specified lumber dimensions are nominal.

- b) Actual dimensions conform to industry standards established by the American Lumber Standards Committee and the rules writing agencies.
- 3. Moisture Content: Unseasoned or 19% maximum at time of permanent closing in of building or structure, for lumber 2" or less nominal thickness.
- 4. Surfacing: Surface four sides (S4S), unless specified otherwise.
- 5. Framing Lumber: 2" to 4" thick, 2" to 4" wide, any commercial softwood specified:
  - a) Light Framing:
    - 1) Plates, blocking, bracing, and nailers: Utility Grade.
    - 2) Bracing, blocking, bulk headings, and general utility purposes: Economy Grade.
    - 3) Grade: Appearance
    - 4) Grade: Appearance, 15% maximum moisture content, MC-15 or KD on grade stamp.
- 6. NOTE: Southern yellow pine of similar quality may be utilized, particularly with preservative treatment.

C. Fire-retardant treated products;

- 1. Lumber: AWWPA C20-70
- 2. Plywood: AWWPA C27-70

E. Preservative-Treated Wood Products:

- 1. Creosote and creosote preservatives for wood placed in ground or in water.
  - a) AWPB LP-55, ground contact application creosote or creosote coal tar solution.
  - b) Pressure treated – water borne preservatives – exposed woods above ground.
    - 1.) AWPB LP-22
  - c) Untreated Lumber: All heartwood grades.

2.02 OTHER MATERIALS:

A. Framing Anchors and Fasteners:

- 1. Non-corrosive, suitable for load and exposure. Drywall screws are not acceptable.
- 2. Plywood Fasteners: Two-part "Tube-Lok" fasteners spaced as noted on the drawings. To assure proper holding and sealing, it is essential that both parts of the nail be driven properly. First, predrill (diameter as recommended by manufacturer) opening into the plywood decking and drive the tube portion with the large head firmly into the plywood decking and existing gypsum decking, being sure that:
  - a. The head is flat and parallel with the plywood sheathing material.
  - b. Drive the insert into the tube. If the insert should bend before being completely seated in the base tube, remove the bent insert and drive another. If the second insert also bends before completely entering the tube, remove the entire nail, tube and all, and repeat in a slightly different location as you are engaging a very hard object in the material. Note: NEVER LEAVE A BENT INSERT IN THE TUBE AND NEVER LEAVE A TUBE WITHOUT AN INSERT.

- B. Provide other materials, not specifically described but required for a complete and proper

installation, as selected by the Contractor, subject to the approval of the A/E.

### PART 3 - EXECUTION

#### 3.01 CONDITIONS OF SURFACES:

- A. Verify that surfaces to receive rough carpentry materials are prepared to exact grades and dimensions.
- B. Erect wood nailing members true to lines and levels. Do not deviate from true alignment more than 1/4 inch.
- C. Space framing members at 16 inches on center unless otherwise directed on the drawings or herein.
- D. Construct members of continuous pieces of longest possible lengths.
- E. Use preservative treated wood in work involved with roofing, door, window blocking, and sills.
- F. Provide edge, and roof opening blocking on top of existing deck surface or top of parapet unless otherwise directed on the drawings.
- G. Provide vertical wood backing to parapets and metal fascia at roof perimeter and as directed on the Contract Documents.
- H. Double-up wall framing members at openings over 100 square inches. Space short members above and below openings in same manner for walls.

#### 3.02 DELIVERIES:

- A. Stockpile materials sufficiently in advance of need to assure their availability in a timely manner for this work.
- B. Make as many trips to the job site as are intended to delivery materials of this section in a timely manner to ensure orderly progress of the work.

#### 3.03 INSTALLATION:

##### A. Pressure-treated Wood Products:

- 1. Provide pressure-treated wood for all framing, blocking, furring, nailing strips built into exterior masonry walls, wood in contact with concrete and in conjunction with gravel stops and roofing when applicable.
- 2. Re-dry and clean lumber, after treatment, to maximum moisture content of 19% stamped "DRY".
- 3. Apply two brush coats of same preservative used in original treatment to all sawed or cut surfaces of treated lumber.

##### B. Plywood Sheathing:

###### 1. Placement:

- a) Place plywood with face grain perpendicular to supports and continuously over at least two supports, except where otherwise shown on the drawings.

- b) Center joints accurately over supports, unless otherwise shown on the drawings.
  - c) Place roof sheathing with end joints staggered. Secure sheets over firm bearing. Maintain minimum 1/16 inch and maximum 1/8 inch spacing between joints of sheets on walls. Place perpendicular to framing members.
2. Protect plywood from moisture by use of waterproof coverings until the plywood, in turn, has been covered with the next succeeding component or finish.

3.04 COMPLIANCE:

- A. Do not permit materials not complying with the provisions of this section to be brought onto or to be stored or used at the job sites.
- B. Promptly remove non-complying materials from the job site and replace with materials meeting the requirements of this section.

3.05 WORKMANSHIP:

- A. Products joints which are tight, true, and well nailed, with members assembled in accordance with the drawings and with pertinent codes and regulations.
- B. Selection of Lumber Pieces:
  - 1. Carefully select the members.
  - 2. Select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing, and will allow making of proper connections.
  - 3. Cut out and discard defects which render a piece unable to serve its intended function.
  - 4. Lumber may be rejected by the A/E, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as for improper cutting and fitting.
- C. Do not shim any framing component.

3.06 GENERAL FRAMING:

- A. In addition to framing operations, normal to the fabrication and erection indicated on the drawings, install wood blocking and backing required for the work of other trades.
- B. Set horizontal and sloped members with crown up.
- C. Do not notch, cut, or bore members for pipes, ducts, or conduits, or for other reasons except as shown on the drawings or as specifically approved, in advance, in writing, by the A/E.
- D. Bearings:
  - 1. Make bearings full, unless otherwise indicated on the drawings.
  - 2. Finish bearing surfaces on which structural members are to rest so as to give sure and even support.
  - 3. Where framing members slope, cut or notch and end as required, to give uniform bearing surface.

3.07 BLOCKING:



- A. Provide wood blocking as required for a complete and proper job and as required by the roofing manufacturer.

3.08 ALIGNMENT:

- A. On framing members to receive a finished surface, align the finish subsurface to vary not more than 1/8" from the plane of surfaces of adjacent furring and framing members.

3.09 FASTENING:

A. Nailing:

1. All nailing shall comply with all requirements of the latest edition of the Rhode Island Building Code.
2. Nail without splitting wood.
3. Prebore as required.
4. Remove split members and replace with members complying with the specified requirements.

B. Bolting:

1. Drill holes 1/16" larger in diameter than the bolts being used.
2. Drill straight and true from one side only.
3. Don't bear bolt threads on wood, but use washers under head and nut where both bear on wood, and use washers under all nuts.

- C. Screws: For lag screws and wood screws, pre-bore holes same diameter as root of threads, enlarging holes to shank diameter for length of shank. Use screws at all replacement plywood substrate at roofs.

- D. **Use only galvanized metal, copper or stainless-steel fasteners in conjunction with preservative-treated wood. Use compatible fastening materials.**

3.10 CLEANING UP:

- A. Remove all excess material from site.

END OF SECTION

## SECTION 06600

### PVC TRIM

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. Work included: Provide cellular PVC board and trim needed to perform carpentry-related work for pertinent construction shown on the drawings, as specified herein and as needed for a complete and proper installation.
- B. Related Work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

##### 1.02 QUALITY ASSURANCE:

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. Regulatory Requirements: Check with Local Building Code for installation requirements.
- C. Allowable Tolerances:
  - 1. Variation in component length:  $-0.00 / +1.00$ "
  - 2. Variation in component width:  $\pm 1/16$ "
  - 3. Variation in component thickness:  $\pm 1/16$ "
  - 4. Variation in component edge cut:  $\pm 2^\circ$
  - 5. Variation in density:  $-0\% + 10\%$
- D. Workmanship, Finish and Appearance:
  - 1. Free foam cellular PVC that is homogeneous and free of voids, holes, cracks, and foreign inclusions and other defects. Edges must be square and top and bottom surfaces shall be flat with no convex or concave deviation.
  - 2. Uniform surface free from cupping, warping, and twisting.

##### 1.03 SUBMITTALS:

- A. Comply with pertinent provisions of Section 01300.

##### 1.04 PRODUCT HANDLING:

- A. Comply with pertinent provisions of Section 01600.
- B. Trim materials shall be stored on a flat and level surface on a full shipping pallet. Handle materials to prevent damage to product edges and corners. Store materials under a protective covering to prevent jobsite dirt and residue from collecting on the boards.

## 1.05 REFERENCES:

- A. ASTM D792 – Density and Specific Gravity of Plastics by Displacement.
- B. ASTM D570 – Water Absorption of Plastics.
- C. ASTM D638 – Tensile Properties of Plastics.
- D. ASTM D790 – Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- E. ASTM D1761 – Mechanical Fasteners in Wood.
- F. ASTM D5420 – Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by means of a Striker Impacted by a Falling Weight.
- G. ASTM D256 – Determining the Pendulum Impact Resistance of Plastics.
- H. ASTM D696 – Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C with a Vitreous silica Dilatometer.
- I. ASTM D635 – Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
- J. ASTM E84 – Surface Burning Characteristics of Building Materials.
- K. ASTM D648 – Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
- L. ASTM D3679 – Standard Specification for Rigid Poly Vinyl Chloride (PVC) Siding.

## 1.06 WARRANTY:

- A. Provide manufacturer's 25-year warranty against defects in manufacturing that cause the products to rot, corrode, delaminate, or excessively swell from moisture.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Basis-of-Design Product: The design for *PVC trim* is based on the products listed below. Comparable products by alternate manufacturers are acceptable subject to compliance with the performance and quality standards established by the listed products.

### 2.02 MATERIALS:

- A. Acceptable Products:

1. AZEK® Trimboards manufactured by Vycom Corporation, 801 Corey Street, Moosic, PA 18507, [www.Azek.com](http://www.Azek.com).
2. Versatex Building Products, LLC, 400 Steel St., Aliquippa, PA 15001 , [www.versatex.com](http://www.versatex.com).

- B. Alternate products are acceptable, as approved equal.
- C. Material: Free foam cellular PVC material with a small-cell microstructure and density of .55 grams/cm<sup>3</sup>.
- D. Performance and Physical Characteristic Requirements:

<u>PROPERTY</u>	<u>UNITS</u>	<u>VALUE</u>	<u>ASTM METHOD</u>
<b>PHYSICAL</b>			
Density	g/cm <sup>3</sup>	0.55	D 792
Water Absorption	%	0.15	D570
<b>MECHANICAL</b>			
Tensile Strength	psi	2256	D638
Tensile Modulus	psi	144,000	D638
Flexural Strength	psi	3329	D790
Flexural Modulus	psi	144,219	D790
Nail Hold	Lbf/in of Penetration	35	D1761
Screw Hold	Lbf/in of Penetration	680	D1761
Staple Hold	Lbf/in of Penetration	180	D1761
Gardner Impact	in – lbs	103	D5420
Charpy Impact (@23°C)	ft – lbs	4.5	D256
<b>THERMAL</b>			
Coefficient of Linear Expansion	in/in/°F	3.2 x 10.5	D696
Burning Rate	in/min	No burn when Flame removed	D635
Flame-Spread Index	--	25	D84
Heat Deflection Temp 264 psi	°F	150	D648
Oil Canning (@140°F)	°F	Passed	D648

### 2.03 ACCESSORY PRODUCTS:

- A. Fasteners:
  - Use fasteners designed for wood trim and wood siding (thinner shank, blunt point, full round head) with PVC trim.
  - Use a highly durable fastener such as stainless steel or hot-dipped galvanized.
  - Staples, small brads and wire nails must not be used as fastening members.
  - The fasteners should be long enough to penetrate the solid wood substrate a minimum of 1-1/2".
  - Use 2 fasteners per every framing member for trimboards applications. Trimboards 12" or wider, as well as sheets, will require additional fasteners.
  - Fasteners must be installed no more than 2" from the end of each board.
  - PVC TRIM should be fastened into a flat, solid substrate. Fastening PVC TRIM into hollow or uneven areas must be avoided.
  - Pre-drilling is typically not required unless a large fastener is used or product is installed in low temperatures.
  - 3/8" and 1/2" sheet product is not intended to be ripped into tri pieces. These profiles must be glued to a substrate and mechanically fastened.
  - Counter-sink all fasteners and provide hidden fastening-plug system.

B. Adhesives:

- Glue all PVC TRIM to PVC trim joins such as window surrounds, long fascia runs, etc. with PVC TRIM Adhesive, a cellular PVC cement, to prevent joint separation. Refer manufacturer requirements.
- The glue joint should be secured with a fastener and/or fastened on each side of the joint to allow adequate bonding time.
- PVC trim adhesive has a working time of ten (10) minutes and will be fully cured in twenty-four (24) hours.
- If standard PVC cements are used, keep in mind these products typically cure quickly which will result in limited working time and may reduce adhesive strength.
- Surfaces to be glued should be smooth, clean and in complete contact with each other.
- To bond PVC trim to other substrates, various adhesives may be used. Consult adhesive manufacturer to determine suitability.

C. Sealants:

- Use urethane, polyurethane or acrylic-based sealants without silicone.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS:

- A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 COORDINATION:

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.03 INSTALLATION:

A. General:

- Set work accurately into position, plumb, level, true and rack-free.

B. Cutting:

- PVC trim products can be cut using the same tools used to cut lumber.
- Carbide-tipped blades designed to cut wood work well. Avoid fine-tooth metal cutting blades.
- Rough edges from cutting may be caused by excessive friction, poor board support, or worn or improper tooling.

C. Drilling:

- PVC trim products can be drilled using the same tools used to drill lumber.
- Drilling PVC trim products is similar to drilling a hardwood. Care should be taken to avoid frictional heat buildup.
- Use standard woodworking drills. Do not use drills made for normal rigid PVC.
- Periodic removal of PVC trim shavings from the drill hole may be necessary.

D. Milling:

- PVC trim products can be milled using standard milling machines used to mill lumber.
- Relief Angle 20° to 30°.
- Cutting speed to be optimized with the number of knives and feed route.

E. Routing:

- PVC trim products can be routed using standard router bits and the same tools used to rout lumber.
  - Carbide-tipped router bits are recommended.
- F. Edge Finishing:
- Edges can be finished by sanding, grinding or filing with traditional woodworking tools.
- G. Nail Location:
- Use two (2) fasteners per every framing member for trimboard applications.
  - Trimboards over 12" or wider, as well as sheets, will require additional fasteners.
  - Fasteners must be installed no more than 2" from the end of each board.
- H. Thermal Expansion and Contraction:
- PVC TRIM products expand and contract with changes in temperature.
  - Properly fastening PVC trim material along its entire length will minimize expansion and contraction.
  - When properly fastened, allow for 1/8" per 18 foot of PVC trim product for expansion and contraction.
  - Joints between pieces of PVC trim should be glued to eliminate joint separation. When gaps are glued on a long run of PVC trim, allow expansion and contraction at ends of the run.

END OF SECTION

## SECTION 07213

### BUILDING INSULATION

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. Provide building insulation where indicated on the drawings and herein in complete conformance with the manufacturer's written instruction and as required for a complete and proper job.

##### 1.02 RELATED WORK SPECIFIED ELSEWHERE:

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

##### 1.03 QUALITY ASSURANCE:

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Use products produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect.
- C. All materials, unless otherwise indicated, shall be manufactured by the same manufacturer and shall be installed in accordance with its current printed directions.

##### 1.04 DELIVERY AND STORAGE OF MATERIAL:

- A. All material shall be delivered in its original unopened packages, and stored in an enclosed shelter providing protection from damage and exposure to the elements. Damaged or deteriorated material shall be removed from the premises.

##### 1.05 PRODUCT HANDLING:

- A. Comply with pertinent provisions of Section 01600.

##### 1.06 SUBMITTALS:

- A. Comply with pertinent provisions of Section 01300.
- B. Product Data: Within fifteen (15) calendar days after the Contractor has received Award of Contract, submit:
  - 1. Materials list of items proposed to be provide under this Section;
  - 2. Manufacturer's specifications and other date needed to prove compliance with the specified requirements;
  - 3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.

C. Shop Drawings:

1. Include location, type, dimensions, arrangement; etc.
2. Indicate joints and accessories.

D. Other Literature by Manufacturer:

1. Printed technical specifications, catalog data, and details of products.
2. Recommended installation and maintenance instructions.

E. Certificates:

1. Manufacturer's certificates that materials comply with specification requirements.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS:

A. For purposes of these specifications, Owen's Corning has been used as the basis of design however either of the following manufacturer's products can be used with written approval of the Architect

1. Johns Manville
2. Knauf
3. Owens Corning

### 2.02 MATERIALS:

A. At all exposed piping under lavatories, provide insulation kit as manufactured by Truebro, Inc.(Or Approved Equal), ADA Conforming, molded closed cell vinyl, 1/8" thick, white. Cover all pipes, valves, etc. Provide installation similar to Manufacturer's Model #102G.

B. Sound Attenuation blankets: (between all studs of interior wall framing partitions and elsewhere as indicated on the drawings)

1. Thermafiber Sound Attenuation blankets: (3-1/2") thick, 16" wide, 48" long.

## PART 3 - EXECUTION

### 3.01 SURFACE CONDITIONS:

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

B. Prior to installation, inspect supporting construction and grounds to assure reinforcement is sufficient for installation of the insulation.

C. Do not proceed with installation until deficiencies are corrected.



3.02 INSULATING BATTS APPLICATION:

- A. Install all insulation in strict conformance with the Rhode Island Building Codes and manufacturer's written instructions, whichever is more stringent.
- B. Install insulation in framing spaces, leaving no voids. Install behind electrical outlets, around structural obstructions, jambs, sills, etc. Cover all such areas as well as plates and headers with vapor barrier paper.
- C. Install Fast-Fit Blankets between studs from interior side of wall, recessed slightly from stud faces. Do not staple - friction fit holds blankets in place unless otherwise directed by the manufacturer in writing.

3.03 SOUND BLANKET APPLICATION:

- A. Install Sound Attenuation Blankets in stud cavities of sound-rated partitions, attaching to one base layer of (sheetrock gypsum panels).
- B. Attach with five (5)-9/16" long staples driven through each blanket, one in center and one spaced in approximately 3 inches from each corner. For reinforcement, drive staples to straddle drywall or similar nails placed against blankets, or through 1-1/2" lengths of PERF-A-TAPE reinforcing tape or equivalent. Butt ends of blankets closely together and fill all voids. Allow air space between backs of blankets and back of opposite face layer.

3.05 CLEAN-UP:

- A. Remove all debris and unused materials from job site a completion of work.

END OF SECTION

**SECTION 07920**  
**SEALANTS AND CAULKING**

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Work Included: Throughout the work seal and caulk joints where shown on the drawings and elsewhere as required to provide a positive barrier against passage of moisture and passage of air.
- B. All necessary packing and back-up material shall be provided at existing locations and as required for a complete and proper installation. Manufacturer's printed recommendations for the preparation of surfaces and handling, mixing and installation of caulking and sealing compounds shall be strictly followed.
- C. Related Work:
  - 1. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.02 QUALITY ASSURANCE:

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

1.03 SUBMITTALS:

- A. Comply with pertinent provisions of Section 01300.
- B. Product Data: After the Contractor has received the Owner's Notice to Proceed, submit:
  - 1. Materials list of items proposed to be provided under this Section.
  - 2. Manufacturer's specifications and other data needed to provide compliance with the specified requirements.
  - 3. Manufacturer's recommended installation procedures which, when approved by the A/E, will become the basis for accepting or rejecting actual installation procedures used on the work.
  - 4. Color samples.
- C. Samples: Accompanying the submittal described above, submit samples of each sealant, each backing material, each primer, and each bond breaker proposed to be used.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Comply with pertinent provisions of Section 01600.
- B. Do not retain or use at the job site, material which has exceeded the shelf life recommended by its manufacturer.

## PART 2 - PRODUCTS

### 2.01 SEALANTS:

- A. To establish a level of quality and performance characteristics desired the specified new sealants and caulking is based upon Tremco Incorporated, 3735 Green Road, Beachwood, OH 044122 (tel) 800-321-7906 <https://www.tremcosealants.com/> or approved equal. Alternate manufacturers may be considered, but are subject to compliance with the requirements specified herein, including but not limited to performance characteristics, colors and warranty.
- B. Provide two-component, rubber based compound complying with FED. Spec. TT-S-00227E, Type 2, Class A with each color of sealant and each class of sealant the product of a single manufacturer selected from the following, or equal products approved in advance by the A/E.
- C. For all joints at aluminum and aluminum-to-masonry: Tremco Primer #10; Sealing Compound; Tremco Spectrum 1-(1) part, moisture-curing silicone joint sealant.
- D. For all joints at metal-to-glass: Tremco Primer 310; Sealing Compound; Tremco Spectrum 2-High-performance, neutral-cure, general-purpose silicone sealant.
- E. For all joints at exterior masonry: Tremco Primer A; Sealing Compound; Tremco Dymeric 511 - (3) part epoxidized polyurethane.
- F. Caulking compound of the 1-part acrylic-type Tremco, Last-O-Metric shall be used for sealing all joints on the building interior where "caulking" is indicated and required.
- G. For other services, provide products especially formulated for the proposed use and approved in advance by the A/E.
- H. Colors:
  - 1. Colors for each sealant installation will be selected by the A/E from standard colors normally available from the specified manufacturers.
- I. In concealed installations and in partially or fully exposed installations where so approved by the A/E, use standard gray or black sealant.

### 2.02 PRIMERS:

- A. Use only those primers which are non-staining, have been tested for durability on the surfaces to be sealed, and are specifically recommended for this installation by the manufacturer of the sealant used.
- B. In general, use Tremco Primer "A" for porous surfaces, Primer B for non-porous surfaces. Provide in strict conformance with manufacturer's written instructions.

### 2.03 BACK-UP MATERIALS:

- A. Use only those back-up materials which are specifically recommended for this installation by the manufacturer of the sealant used, which are nonabsorbent, and which are non-staining.

B. Backing: Joints shall be backed with a close-cell butyl or neoprene rod; with a minimum shore "A" of 70 unless otherwise noted elsewhere. A solid base shall be provided below the joint backing utilizing sand, multiple layers of joint backing, etc., in order to support the sealant. It is important that the backdrop material be of a type to which the sealant does not adhere in a working joint.

C. Acceptable Types Include:

1. Closed-cell resilient urethane or polyvinyl-chloride foam;
2. Closed-cell polyethylene foam;
3. Closed-cell sponge of vinyl or rubber;
4. Polycholoprene tubes or beads;
5. Polyisobutylene extrusions; and
6. Oil-less dry jute.

D. Do not block weep holes

#### 2.04 BOND PREVENTATIVE MATERIALS:

A. Use only one of the following as best suited for the application, and as recommended by the manufacturer or the sealant used:

1. Polyethylene tape, pressure-sensitive adhesive, with the adhesive required only to hold tape to the construction materials as indicated.
2. Aluminum foil complying with MIL-A-148E.
3. Wax paper complying with Fed. Spec. UU-P-270.

#### 2.05 MASKING TAPE:

A. For masking around joints, provide masking tape complying with Fed. Spec. UU-T-106c.

#### 2.06 OTHER MATERIALS:

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the A/E.

### PART 3- EXECUTION

#### 3.01 SURFACE CONDITIONS:

A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

#### 3.02 PREPARATION:

A. Concrete and Masonry Surfaces:

1. Install only on surfaces which are dry, sound, and well brushed, wiping free from dust.
2. At open joints, remove dust by mechanically blown compressed air, if so required.
3. Use solvent to remove oil and grease, wiping the surfaces with clean rags.

4. Where surfaces have been treated, remove the surface treatment by sandblasting, wire brushing or grinding.
5. Remove laitance and mortar from joint cavities.
6. Where backstop is required, insert the approved backup material into the joint cavity to the depth needed.
7. Joints and spaces filled with sealant greater in depth than the width of the joint shall be filled so that the depth of the joint shall be equal to the width of the joint. The depth of the joint shall not be less than 3/8". Packing for the joints shall be of the materials specified. Packing shall provide a firm back-up for the sealant via the manufacturer's written instructions.
8. Joints and spaces caulked with Tremco Dymeric sealant shall not be more than 3/8" wide by 3/8" deep. Minimum size of joints caulked shall be recommended by the manufacturer. Joints more than 3/8" in depth shall be packed as specified.
9. Color: As selected by the A/E.
10. Priming: As recommended by the sealant manufacturer.

B. Steel Surfaces in Contact with Sealant:

1. Sandblast as required or prepare surfaces in accordance with manufacturer written instruction to achieve acceptable surface for bond.
2. If sandblasting is not practical, or would damage adjacent finish, scrape the metal or wire brush to remove mill scale.
3. Use solvent to remove oil and grease, wiping the surfaces with clean rags.
4. Remove protective coatings on steel by sandblasting or by using a solvent which leaves no residue.

C. Aluminum Surfaces in Contact with Sealant:

1. Remove temporary protective coatings, dirt, oil, and grease.
2. When masking tape is used for protective cover, remove the tape just prior to applying the sealant.
3. Use only such solvents to remove protective coatings as are recommended for that purpose by the manufacturer of the aluminum work, and which are non-staining.

3.03 INSTALLATION OF BACK-UP MATERIAL:

- A. Use only the back-up material recommended by the manufacturer of the sealant used, and approved by the A/E for the particular installation, compressing the back-up material 25% to 50% to achieve a positive and secure fit.
- B. When using back-up tube or rod stock, avoid lengthwise stretching of the material. Do not twist or braid hose or rod back-up stock.

3.04 BOND-BREAKER INSTALLATION:

- A. Provide an approved bond-breaker where recommended by the manufacturer of the sealant, and where directed by the A/E, adhering strictly to the installation recommendations as approved by the A/E.

3.05 INSTALLATION OF SEALANTS:

- A. Prior to start of installation in each joint, verify the joint type according to details on the drawings, or as otherwise directed by the A/E, and verify that the required proportion of width of joint to depth of joint has been secured.
- B. Equipment:
  - 1. Apply sealant under pressure with power-actuated or hand gun, or by other appropriate means.
  - 2. Use guns with nozzle of proper size and providing sufficient pressure to completely fill the joints as designed.
- C. Thoroughly and completely mask joints where the appearance of sealant on adjacent surfaces would be objectionable.
- D. Install the sealant in strict accordance with the manufacturer's recommendations as approved by the A/E, thoroughly filling joints to the recommended depth.
- E. Tool joints to the profile shown on the drawings, or as otherwise required if such profiles are not shown on the drawings.
- F. Cleaning Up:
  - 1. Remove masking tape immediately after joints have been tooled.
  - 2. Clean adjacent surfaces free from sealant as the installation progresses, using solvent or cleaning agent recommended by the manufacturer of the sealant used.

END OF SECTION

## SECTION 08212

### WOOD DOORS AND FRAMES

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. This section covers all wood doors. Refer to Section 08100 for Steel Frame Specifications.
- B. Related Work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

##### 1.02 QUALITY ASSURANCE

- A. Acceptable Manufacturers: Qualified to affix each door with National Woodwork Manufacturers' Association (NWMA), Seal of Approval or qualify certification stamp.
- B. Requirements of Regulatory Agencies:
  - 1. Underwriter's Laboratories, Inc. (UL), Fire Doors (120 IDO) for fire classification marking.
  - 2. National Fire Protection Association (NFPA), "Standard fire Doors and Windows", NFPA No. 80 for installation of fire-rated doors.
- C. Testing Requirements:
  - 1. Adhesives - NWMA 1.S.I-69
    - a. Waterproof bond test for exterior doors (when applicable).
    - b. Water-resistant bond test for interior doors (when applicable).
  - 2. Warp - NWMA 1.S.I-69
  - 3. Fire Test: Underwriter's Laboratories, Inc., Standard UL 10(b), Fire Tests of Door Assemblies.

##### 1.03 SUBMITTALS:

- A. Samples: Submit samples showing face veneers and finish
- B. Shop Drawings - Show details and door configuration.
  - 1. Full-size moulding section detail and door configuration.
  - 2. Glazing material and louver thickness, when applicable.
- C. Certificates: Certificates of compliance with fabrication and test requirements signed by authorized representative of door manufacturing company.

##### 1.04 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver doors to site after plaster and cement are dry and building has reached average prevailing relative humidity of locality.
- B. Deliver doors in manufacturer's original unopened protective material or container, clearly marked with manufacturer's name, brand name, size, thickness, and identifying symbol on covering.
- C. Seal all four edges of doors when delivered to project site.
- D. Stack flat on 2 × 4 lumber, laid 12 inches from ends and across center.
- E. Under bottom door and over top of stack, provide plywood or corrugated cardboard to protect door surface.
- F. Store doors in area where there will be no great variations in heat, dryness and humidity.
- G. Do not drag doors across one another.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS:

- A. Specific products or materials manufactured by any of the following listed manufacturers are "acceptable" (not approved) only if the specific product or material can evidence exact compliance with the Contract Documents.
  - 1. Masonite Architectural
  - 2. Eggers, Neenah, Wisconsin
  - 3. Graham Manufacturing Corporation, Marshfield, Wisconsin.
  - 4. Weywehauser Company, Marshfield, Wisconsin.
- B. Provide the product of one manufacturer.

### 2.02 MATERIALS:

- A. Doors: Flush Wood Doors:
  - 1. Door standards: NWMAI-S: - 69
  - 2. Clear Maple Veneer
  - 3. Provide Plain Sliced, seamless "Book Match" with hardwood edge on all surfaces
  - 4. Finish: Doors shall be UV-cured factory finished.
  - 5. Refer to door schedule.
  - 6. Field verify all dimensions and field conditions.
  - 7. All doors shall be manufactured to suit new frame assembly conditions.
  - 9. Core: Solid wood core glued block or framed-block glued core.
  - 10. UL Approved "C" and "B" Labeled Fire rated doors: Edge bands of KILN-DRIED Hardwood treated with fire retardant treatment.
- B. Hollow Metal Frames:
  - 1. Frames shall be combination buck, frame and trim type.
  - 2. Minimum Gages: 16 gauge interior.
  - 3. Brake-form steel sheets.
  - 4. Frames in masonry shall have reinforced heads.
  - 5. Provide profiles and shapes free of warp, buckles, fractures or other defects.



6. Form stops integral with frames unless otherwise shown.
7. Corners and connections shall be mitered and welded with exposed welds ground flush and smooth.
8. Anchors:
  - a. Provide an anchor at each jamb for each 2'-6" of door height or fraction thereof unless otherwise noted.
  - b. Vary anchor types to provide positive fastening to adjacent construction.
  - c. Secure a metal clip angle at bottom of each jamb member for anchoring to floor with a minimum of 2 fasteners.
9. Provide and install rubber door silencers in all interior door frames. (Not less than two (3) silencers on the lock side of single doors, and one (2) silencer for each leaf in heads of double door frames).

#### 2.03 LABELED DOORS AND FRAMES:

- A. Doors and frames designated to be labeled shall bear UL label.
- B. Where label is not required, submit manufacturer's certificate that construction conforms to Testing Agencies' requirements for label indicated.
- C. Furnish statement on label that construction provides the heat transmission rating of a maximum of 250°F in 30 minutes or as required on the drawings.

#### 2.04 FRAME FINISHING:

- A. Frames shall be leveled and ground smooth.
- B. Apply mineral filler to eliminate weld scars and other blemishes.
- C. Give factory coat of rust-inhibitive metal primer. Frames shall receive a coat of air dry, vinyl base metal primer # MP-139 grey.
- D. Paint all surfaces and edges of frame assembly.

#### 2.05 FABRICATION:

- A. Moisture Content: 12% maximum at time of fabrication for all wood material.
- B. Solid Core:
  1. Glued Block Core: Core blocks 2-1/2 inches maximum width, bonded together; end joints staggered in adjacent rows.
  2. Bond face panels of core.
- C. Face Panels:
  1. Book match veneers for grain and color for doors hung in pairs.
- D. Light Openings: Mouldings and glass stops of matching wood.
- E. Louvers: Factory-install matching wood louvers into prepared openings.
- F. Clearances:
  1. Allow maximum of 1/8 inch at jamb and head for job fit doors.
  2. Allow maximum of 3/16 inch at jamb and head for pre-fit doors.

3. Allow maximum of 3/16 inch over threshold or saddle.
4. Allow maximum of 1/2 inch over decorative floor coverings, unless otherwise noted on drawings or in the Project Manual.
5. Maximum 3/8 inch between door bottoms and decorated floor for pairs of doors unless otherwise noted on drawings or in the Project Manual.
6. Maximum Warp: 1/4 inch.

A. Finishing:

1. Factory finish doors, faces and side edges on site. Finish shall be as noted herein or on the drawings and shall be approved by the Architect.

2.06 PREPARATION FOR FINISH HARDWARE:

A. Prepare doors and frames to receive hardware.

1. Hardware supplier shall furnish hollow metal manufacturer approved hardware schedule, hardware templates, and samples of physical hardware where necessary to insure correct fitting and installation.
2. Coordinate all electrified hardware/security components with doors and frames and prepare doors and frames to receive any required components.
3. Preparation includes sinkage and cutouts for mortise and concealed hardware.

PART 3 - EXECUTION

3.01 INSPECTION:

- A. Verify that doors are of type required for frame and are installed as required for proper installation of doors.
- B. Fire-rated doors shall be installed in corresponding fire rated frames.

3.02 INSTALLATION:

- A. Follow door manufacturer's written instruction for all installation work.
- B. Do not install doors in frames which would hinder the operation of the doors.
- C. Fire-Rated Doors:
  1. Install in accordance with National Fire Protection Association (NFPA) recommendations.

3.03 ADJUST AND CLEAN:

- A. Replace or re-hang doors which are hinge-bound and do not swing or operate freely.
- B. Replace doors damaged during installation.

END OF SECTION

## SECTION 08710

### FINISH HARDWARE

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. The work of this section shall be coordinated with the Door Hardware Schedule listed in the Construction Drawings. It is the responsibility of the Contractor to assemble all Hardware covered by this section into the Hardware sets listed in the Door Hardware Schedule.**
- B. The work covered by these specifications shall include the furnishing and delivery to the job site of finish hardware, complete and in strict accordance with these specifications and the applicable drawings, and ready for prompt and complete installation by the Contractor.
- C. It shall be the sole responsibility of the Contractor to provide all necessary items of hardware required for a complete and proper installation. Any hardware item required and not definitely specified herein, or not specifically mentioned but necessary for complete installation of the work, shall conform in type and quality to the items specified and shall be provided by this Contractor as part of his Contract at no additional cost to the Owner.
- D. Provide all electrical work as a requirement of other pertinent sections herein or manufacturers and vendors, for a complete and proper job for any electrified hardware or components.
- E. Related Work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary/Special Conditions, and sections in Division 1 of these Specifications.
  - 2. Work related to items/components listed in the following Sections:
    - a. Section 08212 "Wood Doors and Frames"

##### 1.02 SUBMITTALS:

- A. Samples: The Contractor shall submit to the Architect and Owner for approval.
- B. Hardware Schedule: The Contractor shall submit to the Architect for review, (3) copies of a complete and properly itemized schedule of all finish hardware be furnished under this Contract with the calling of each item clearly referred to as per manufacturer's code letters and numbers.
- C. Templates: The complete template information necessary for the fabrication of doors and frames etc.
- D. Manufacturer's Recommendations: Prior to installation, deliver to all installing personnel, complete recommendations from the manufacturer regarding installation methods.

1.03 GUARANTEE/QUALITY ASSURANCE:

- A. All material furnished under this Contract shall be guaranteed free from defects by manufacturer for a period of one (1) year from the date of Final Acceptance of the building. Any defective material shall be removed and replaced at no expense to the Owner.
- B. Qualifications of Supplier: The finish hardware supplier shall have in his employ an AHC member of the American Society of Hardware Consultants who shall be made available for consultation at no additional cost to the Owner and Architect during the course of construction.
- C. Review by AHC: (manufacturer's hardware consultant)
  - 1. The AHC shall be present at completion of the work, shall check the installation of all finish hardware, shall make all minor adjustments required and supervise all hardware replacements required. He shall report to the Architect on completeness of the installation.
  - 2. The Manufacturer's Hardware Consultant shall review and approve all submittals prior to Contractor ordering product.
- D. Contractor and Manufacturer's Hardware Consultant shall field verify and verify that specified equipment is properly suited for each particular application. Do so prior to submitting bid.

1.04 PACKING AND MARKING:

- A. All hardware items required shall be individually packed, complete with all screws, bolts, washers and all other necessary accessories for proper installation. Each individual container shall be marked with item numbers corresponding to numbers on the approved schedule identifying contents and location of the item in the finished work. After delivery, this Contractor shall lay out all the hardware in a designated secure area and then check same with the General Contractor's representative.
- B. Delivery:
  - 1. Deliver all finish hardware to the installers in a timely manner to ensure orderly progress of the total work.

1.05 WORK INCLUDED:

- A. All labor, materials, templates, equipment and services required to furnish and install the finish hardware complete as required by the drawings, as herein specified and as prepared by BHMA certified door hardware consultant.
- B. All electrical-related work, refer to electrical drawings and pertinent other sections of this Project Manual.

1.06 WORK NOT INCLUDED:

- A. Hardware for the following items if and when applicable in other sections of the specifications:
  - 1. Installation by other sections unless otherwise noted.
  - 2. Sash Hardware
  - 3. Toilet Partition Hardware
  - 4. Toilet Accessories

1.07 U.L. REQUIREMENTS:

- A. Provide hardware which complies with NFPA Standards #80 for Fire-Rated openings and #101 for Life Safety. Only hardware which has been tested and listed by U.L. for the type and sizes of doors required and which complies with the requirements of the door and frame label is acceptable.

PART 2 - PRODUCTS

2.01 FASTENERS:

- A. Furnish all finish hardware with all necessary screws, bolts and other fasteners of suitable size and type to anchor the hardware in position for long life under hard use.
- B. Furnish fastenings where necessary with expansion shields, toggle bolts, sex bolts and other anchors approved by the A/E, according to the material to which the hardware is to be applied and the recommendations of the hardware manufacturer.
- C. Design - all fastening shall harmonize with the hardware as to material and finish.

2.02 KEYING:

- A. Final Keying System:
  - 1. Contractor to schedule a coordination meeting prior to the order and submittal of all door hardware to review keying with Owner and door supplier.
  - 2. Grand masterkey all locks on the project to the Owner's Master Key System, factory keyed and/or as directed by Owner.
  - 3. Cylinders shall have Special Keyway.
  - 4. Deliver three (3) change keys for each lock plus three (3) masterkeys to the Owner.
  - 5. Provide "Key Log" to Owner upon completion of project.

2.03 ACCEPTABLE MANUFACTURERS:

- A. To establish a level of quality and performance characteristics the desired specified hardware is based upon the systems listed herein. Alternate manufacturers may be considered, but are subject to compliance with the requirements specified herein, including but not limited to performance, style, characteristics, colors and warranty. Manufacturer's trade names are listed to establish a level for compliance.
- B. Submit to Architect, written statement that Owner has reviewed and accepts specified hardware. Submit all revisions to Architect for review prior to ordering.
- C. Field verify all dimensions prior to ordering – Contractor shall be responsible for dimensional correctness.
- D. Hardware shall be equal to or exceed the properties of the following products:
  - 1. Hinges:
    - 5 Knuckle Full Mortise- Stanley Heavy Duty Series
    - 5 Knuckle Full Mortise Non Removable Pin- Stanley Heavy Duty Series

2. Locksets:
  - Schlage Extra Heavy Duty Commercial with Interchangeable Core - Lever - Rhodes
    - Sleeping Quarters Privacy Lock: ND40S
    - Bathroom Privacy Lock: ND40S
  
3. Door Stops and Holders: Ives
  - Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
  - Where wall stops cannot be used, provide dome type floor stops of the proper height.
  
4. Thresholds
  - Saddle thresholds – Reese - 1/2" high x jamb width x door width
    - AAB compliant aluminum, length to suite field condition Or Approved Equal
  
5. Bottom Door Sweeps:
  - Manufacturer – Pemko, Hager; National Guard Products, or approved equal
  - Product description - Heavy Duty Surface mounted brush door sweep
  
6. Silencers:
  - Ives - Push in type silencers.
    - Provide three (3) for each single frame and two (2) for each pair frame.

2.04 FINISHES:

- A. Finish of all hardware shall be US26D (BHMA 626/652) with the following exceptions:
  1. US32D (BHMA 630) for Hinges at Exterior Doors, Push Plates, Pulls and Push Bars, Protection Plates, Overhead Stops and Holders, Wall Stops, Latch Protectors.
  2. Mill Finish Aluminum: Thresholds

2.05 OTHER MATERIALS:

- A. All other materials not specifically described but required for a complete and proper finish hardware installation shall be as selected by the Contractor subject to the approval of the A/E.

PART 3 - EXECUTION

3.01 DELIVERIES:

- A. Stockpile all items sufficiently in advance to ensure their availability and make all necessary deliveries in a timely manner to ensure orderly progress of the total work.

3.02 PROTECTION:

- A. Finish hardware shall not be installed until all operations or work causing dampness has been completed and thoroughly dried. Knobs, handles and projecting parts shall be wrapped in cloth or soft paper to protect the finish until the project is accepted by the Owner.

3.03 INSPECTION OF INSTALLATION:

- A. Upon completion of the installation and as a condition of its acceptance, deliver to the A/E, a report signed by the AHC stating that his/her inspection was made, that all adjustments recommended by him have been completed and that all finish hardware furnished under this section has been installed and is in optimum working condition.

3.04 FINISH HARDWARE SCHEDULE:

- A. The Contractor shall be responsible for complete examination of the drawings and shall furnish all hardware required for a complete and proper installation.

END OF SECTION

## SECTION 08810

### INSULATED METAL WINDOW PANELS

#### PART 1 – GENERAL

##### 1.01 DESCRIPTION:

- A. This section shall consist of all labor, equipment, and materials necessary to complete the installation of all insulated metal window panels as indicated on the drawings, herein indicated, or both.
- B. Related Work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

##### 1.02 SUBMITTALS:

- A. Full-sized details of fastenings, setting blocks and spacers as well as complete schedule of location of each type of panel shall be submitted in accordance with the Sections 01330, Submittals, 01350, Submittal Procedures and 01400, Quality Requirements, prior to ordering materials.
- B. Samples:
  - a. Panel makeup - 2 samples - 10"x10"
  - b. Two (2) samples of each color and finish texture - 3"x5"
- C. Submission Drawings: Indicate thickness, dimension and components of parts. Detail glazing methods, framing and tolerances to accommodate thermal movement.
- D. Affidavit certifying materials meet all requirements as specified.
- E. Two (2) copies of manufacturer's standard literature for specified material.

##### 1.03 PRODUCT HANDLING:

- A. All materials shall be delivered, stored, handled and installed so as not to be damaged.
- B. Each panel shall bear manufacturer's label indicating name of manufacturer and quality of panel, including weight or thickness where applicable. Absence of label may constitute cause for rejection, except that cut from local stock. Vendor shall furnish affidavit attesting to compliance with specification and stating manufacturer's name, quality, thickness and type of panel furnished.
- C. Panel shall be stored in a clean, dry area to prevent staining.
- D. Panel shall be delivered in the manufacturer's original unopened containers, bearing the manufacturer's label.



- E. Panel shall be carefully handled so as to prevent scratching and chipping. Do not remove paper covering until time recommended by manufacturer.
- F. Protect finish and edge in accordance with panel manufacturer's recommendations.
- G. Store materials in accordance with panel manufacturer's recommendations.

1.04 ENVIRONMENTAL CONDITIONS:

- A. Glazing shall not be completed when the ambient temperature is below 40 degrees F., except that the Contractor may erect suitable enclosures with adequate heating of enclosed space to raise surface temperatures of frames and panel above 40 degrees F.

1.05 QUALITY ASSURANCE:

- A. Panel manufacturer shall have a minimum of 25 years' experience.
- B. Field measurements shall be taken prior to completion of manufacturing and cutting.
- C. Maximum deviation from vertical and horizontal alignment of installed panels is 1/8" (3mm) in 20' (6m) non-commutative.
- D. Bidders are directed to visit site and become familiar with actual sizes and existing conditions prior to submitting bid. Notify Architect prior to submitting bid, of any condition different from that specified.

1.06 REFERENCES:

- A. American Society of Testing Materials (ASTM)
  - 1. E330-84: Structural Performance of Exterior Windows, Curtain Walls and Doors under the influence of wind loads.
  - B. D1781-76: Climbing Drum Peel Test for Adhesives.
  - 2. D3363-74: Method for Film Hardness by Pencil Test.
  - 3. D2794-90: Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
  - 4. D3359-90: Method for Measuring Adhesion by the tape test.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. Basis-of-Design Product: The design for *Insulated Metal Window Panels* is based on the products listed below. Comparable products by alternate manufacturers are acceptable subject to compliance with the performance and quality standards established by the listed products.
- B. Acceptable Products: Mapes Architectural Panels, LLC, Lincoln, NE. Panels consist of metal skins laminated to stabilizer substrates with an insulating core material. Panels are designed to be glazed into an existing window system.
- C. Substitutions: As approved equal by the Architect.

D. Requests for substitutions will be considered in accordance with provisions of Section 01600.

## 1.02 MATERIALS:

### A. Panels – Laminated:

1. Laminated metal-faced Mapes-R panels as manufactured by Mapes Industries, Inc.
2. Acceptable alternatives: Panels having similar composite construction and finish providing manufacturer has a minimum of 20 years' panel laminating experience and comparable published warranties.

### B. Finish:

1. Finishes
2. Exterior: Custom Kynar
3. Interior: Custom Kynar
4. Color as selected by Architect from manufacturer's standard color chart.

### C. Panel Fabrication:

1. Exterior Substrate: Solid Plastic (SPS)
2. Core: Isocyanurate
3. Interior Substrate: Solid Plastic (SPS)
4. Tolerances - 0.8% of panels dimension length and width - (+/-) 1/16" thickness
5. Panel Thickness - 1.25 inches approximate
6. R-Value – 8.28
7. U-Value - 0.12

### D. Accessories:

1. Recommended for use as an infill panel component in window and curtain wall systems. Related material to complete installation as recommended by the manufacturer.
2. Seals against moisture intrusion as recommended by the manufacturer. Polyurethane and silicone based sealant with a 20-year life are required.

## 2.03 INSPECTION SURFACES:

- A. All surfaces of openings to receive panel shall be examined for defects insofar as they affect panel and glazing work. Glazing work shall not be started until such defects have been corrected.

## 2.04 PREPARATION FOR INSTALLATION:

- A. All surfaces of openings shall be properly primed where necessary and protective coatings removed from surfaces to be glazed.
- B. Protective coatings, film, etc. shall be removed from aluminum surfaces to be glazed. Use a solvent which will not etch or mar the finish.
- C. All surfaces to be sealed shall be dry, free from oil, dust, etc. and wiped clean before applying sealants.

- D. Panel shall be free from dust, oil, etc. and wiped clean immediately before installation.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

##### A. Glazing:

1. Panel bedded, backs puttied, secured in place and, except where glazing beads are required, shall be face puttied. Secure panel with non-ferrous glazier's points or clips or beads as required.
2. Panel surfaces shall be free from defects prior to installation.
3. Provide neoprene setting blocks as required.
4. Glaze all operating sash in closed position.
5. All panels shall be cut to fill sizes required for the openings from measurements taken at the project site. All cut edges shall be smooth and straight.
6. Stops and glazing beads, where provided, shall be removed before glazing and carefully reset after glazing.
7. Labels shall not be removed until final approval is obtained.

##### B. Install panel with waviness parallel to floors, plumb, level and true.

##### C. Glaze panels securely and in accordance with approved shop drawings and manufacturer's instructions to allow for necessary thermal movement and structural support.

##### D. All panels and glazing shall be installed according to manufacturer's printed instructions, in strict compliance with the recommended practice as stated in "The Flat Panel Jobbers Association Glazing Manual", latest edition.

##### E. Do not install panels that are observed to be defective including warped, bowed, dented, scratched and delaminating components.

##### F. Weatherseal all joints as required using methods and materials as previously specified.

##### G. Separate dissimilar metals using gasketed fasteners and blocking to eliminate the possibility of electrolytic reaction.

#### 3.02 PROTECTION AFTER INSTALLATION:

##### A. After installation, precaution shall be taken against breakage or other damage to panel.

##### B. Glazed openings shall be identified with colorful flags or festoons attached to the panel holding members at the head of jambs.

##### C. Panel shall be protected from plaster, sandblasting and welding spatter.

##### D. Replace any damaged panels at no expense to the Owner.

3.03 CLEAN-UP:

- A. Remove masking film as soon as possible after installation. Masking left in place after panel installation will be the responsibility of the contractor.
- B. All panels, wood and metal to be cleaned of excess glazing compound.
- C. Wash panel completely after installation.
- D. Damaged panels found after proper installation and cleaning shall be the responsibility of the General Contractor at no additional cost to the Owner.
- E. Panels damaged because of faulty setting shall be replaced by the Contractor at no additional cost to the Owner.
- F. Remove all damaged panels, glazing compound, etc., from site after completion of work.
- G. Weep holes and drainage channels must be unobstructed and free from dirt and sealant.

3.04 WARRANTY:

- A. Provide manufacturer's standard warranty, twenty-five (25) years, against defects such as delamination and edge separation.

END OF SECTION

**SECTION 09290**  
**GYPSUM WALL 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.

**1.3 ACTION SUBMITTALS**

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

- B. Sustainable Design Submittals:

- 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- 2. Product Certificates: For materials manufactured within 100 miles of Project, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each raw material.
- 3. Product Data: For adhesives and sealants, indicating VOC content.
- 4. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.
- 5. Laboratory Test Reports: For ceiling and wall materials, indicating compliance with requirements for low-emitting materials.

- C. Samples: For the following products:

- 1. Trim Accessories: Full-size Sample in 12-inch long length for each trim accessory indicated.
- 2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

- D. Samples for Initial Selection: For each type of trim accessory indicated.

- E. Samples for Verification: For the following products:

- 1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.
- 2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

#### 1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
  - 1. Build mockups for the following:
    - a. Each level of gypsum board finish indicated for use in exposed locations.
    - b. Each texture finish indicated.
  - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
  - 3. Simulate finished lighting conditions for review of mockups.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.5 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.

#### 1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. 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.
- C. Ceiling and wall materials shall comply with the 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 GYPSUM BOARD, GENERAL

- A. Regional Materials: Products shall be manufactured within 100 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
- B. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

## 2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C 1396/C 1396M.
  - 1. Basis-of-Design: To establish a level of quality and performance characteristics the desired specified gypsum board is based upon USG Corporation; USG Sheetrock® Brand Gypsum Panels. Alternate manufacturers may be considered, but are subject to compliance with the requirements specified herein, including but not limited to performance, style, characteristics, colors and warranty. Manufacturer's trade names are listed to establish a level for compliance.
  - 2. Subject to compliance with requirements, provide USG Corporation; USG Sheetrock® Brand Gypsum Panels or approved equal.
  - 3. Thickness: Match existing.
  - 4. Long Edges: Tapered

## 2.4 METAL STUDS

- A. Metal Studs:
  - 1. At interior metal stud partitions and ceilings, unless otherwise shown on the drawings, provide standard punched steel studs of 20-gauge, hot-dip galvanized; size as shown on the drawings.
  - 2. At interior metal stud partitions and ceilings, unless otherwise shown on the drawings, provide standard punched steel studs of 20-gauge, hot-dip galvanized; size as shown on the drawings.
  - 3. Use only one type throughout the work, unless otherwise shown on the drawings or specifically approved in advance by the A/E.
  - 4. At interior metal stud partitions and ceilings, unless otherwise shown on the drawings, provide standard punched steel studs of 20-gauge, hot-dip galvanized; size as shown on the drawings.
- B. Metal header assemblies:
  - 1. Provide punched steel studs of 18 gauge, hot-dip galvanized; size as shown on the drawings.
- C. Metal Studs to each end of metal header assembly:
  - 1. Provide punched steel studs of 18 gauge, hot-dip galvanized; size as shown on the drawings.
- D. Metal Furring:

1. Provide standard steel furring channels of 22 gauge, hot-dip galvanized; size as shown on the drawings.

E. Metal Runner:

1. Width of studs by 1" high × standard length.
2. Required at head and floor and as header over doors.

- F. Accessories: Provide all accessories including, but not necessarily limited to, tracks, clips, anchors, fastening devices, sound attenuation pencil rods, and resilient clips, and other accessories required for a complete and proper installation, and as recommended by the manufacturer of the steel studs used.

## 2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
2. Shapes:
  - a. Cornerbead.
  - b. Bullnose bead.
  - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
  - d. L-Bead: L-shaped; exposed long flange receives joint compound.
  - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
  - f. Expansion (control) joint.
  - g. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Fry Reglet Corporation.
  - b. Gordon, Inc.
  - c. Pittcon Industries.
  - d. Schluter Systems
2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

## 2.6 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, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
  - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-tape and all-purpose compound.
    - a. Use setting-type compound for installing paper-faced metal trim accessories.
  - 3. Fill Coat: For second coat, use setting-type, sandable topping and all-purpose compound.
  - 4. Finish Coat: For third coat, use setting-type, sandable topping and all-purpose compound.
  - 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

## 2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
  - 1. Use screws complying with ASTM C 954 for fastening panels to steel members, masonry and wood members from 0.033- to 0.112-inch thick.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install 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.

- 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. 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 instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

### 3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  - 1. Wallboard Type: Vertical surfaces unless otherwise indicated.
  - 2. Type X: Where required for fire-resistance-rated assembly.
- B. Single-Layer Application:
  - 1. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
  - 2. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
  - 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

### 3.4 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  - 1. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
    - a. Primer and its application to surfaces are specified in Section 09910 "Painting."
    - b. Finish to match existing.

### 3.5 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, or 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 09290

## SECTION 09310

### CERAMIC TILE

#### PART 1 – GENERAL

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all SECTIONS within DIVISION 1 – GENERAL REQUIREMENTS which are hereby made a part of this section of Specifications.

#### 1.01 DESCRIPTION:

- A. Provide ceramic tile and all related materials and accessories where indicated on the drawings and herein and as required for a complete and proper job.

B. Related Work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

#### 1.02 QUALITY ASSURANCE:

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

#### 1.03 SUBMITTALS:

- A. Comply with pertinent provisions of Section 01300.

B. Samples - Submit in duplicate:

1. Ceramic wall, floor & base tiles.
2. Trim Shapes - each color, type, and shape
3. Accessories - each color, type and style

C. Certificates:

1. Master Grade Certificate:

- a) Conform to ANSI A137-1
- b) Furnish for standard grade tiles
- c) State grade, kind of tile, identification marks for tile packages, and name and location of project.
- d) Issued and signed by manufacturer when tile is shipped.
- e) Furnish the Architect and Owner each with one (1) copy of all certificates issued.

2. Manufacturers of mortars, adhesives, and grouts to certify that materials:

- a) Are suitable for intended use,
- b) Meet or exceed the standards of American National Standards Institute (ANSI) and Tile Council of America Inc. (T.C.A.)

- D. Manufacturer's Instruction - Furnish manufacturer's instructions for the use of Tile Council of America (T.C.A.)

- E. Extra Stock - 12 pieces of trim for every color - 25 pieces of field wall tile and floor tile for every color and shape.
  - 1. Neatly package, label and deliver to the Owner all extra stock specified at the completion of all work required by this Section.

Note: Bidders are to provide the greater of the value of Extra stock noted above and in Part 1.07 of this specification.

#### 1.04 PRODUCT LABELING, DELIVERY & HANDLING:

- A. Deliver materials in manufacturer's original sealed containers.
  - 1. Labels legible and intact, identifying brand name and contents.
  - 2. Tile cartons grade-sealed by manufacturer in accordance with ANSI A137.
  - 3. Grade-seals unbroken.
  - 4. Manufactured mortars and grouts shall contain hallmarks certifying compliance with reference standards and be the types recommended by the tile manufacturer for application.
  - 5. Adhesives in containers labeled with hallmarks certifying compliance with reference standards.
- B. Deliver mastic grout ready for use.
- C. Deliver dry set mortar in sealed, moisture-proof containers.
- D. Store materials under cover in manner to prevent damage or contamination.
- E. All materials will be stored in an area where the temperature does not go below 50°F at any time. Materials stored at lower temperatures will not be used on this project.

#### 1.05 JOB CONDITIONS:

- A. Environmental - Set and grout tile when ambient temperature is at least 50°F (10°C) and rising.
- B. Protection - Protect adjoining work surfaces before tile work begins.

#### 1.06 EXTRA STOCK:

- A. Deliver to the Owner for his use in future modifications, an extra stock of approximately 10% of each color and pattern in each material installed under this Section, packaging each type of material separately, distinctly marked, and adequately protected against deterioration.

Note: Bidders are to provide the greater of the value of Extra stock noted above and in Part 1.07 of this specification.

## PART 2 – PRODUCTS

### 2.01 BASIS OF DESIGN

- A. To establish a level of quality and performance characteristics the desired specified tile is based upon Daltile Corporation Tile. Alternate manufacturers may be considered, but are subject to compliance with the requirements specified herein, including but not limited to

performance, style, characteristics, colors and warranty. Manufacturer's trade names are listed to establish a level for compliance.

2.02 MANUFACTURER:

- B. American Olean Tile Co.
- C. Roca Tile USA.
- D. Or Approved Equal

2.03 CERAMIC MOSAICS:

A. CT-1 (Ceramic Tile – Type 1) Glazed Porcelain Tile: (Water Closet Floor)

- 1. Material: Glazed Porcelain
- 2. Series: Volume 1.0
- 3. Pattern: Running Bond – Long Length Horizontal
- 4. Size: 12x24
- 5. Color: Intensity Pebble VL 72
- 6. Features: Rectangle

B. CT-2 (Ceramic Tile – Type 2) Glazed Porcelain Tile: (Water Closet Walls)

- 1. Material: Glazed Porcelain
- 2. Series: Volume 1.0
- 3. Pattern: Stack Bond
- 4. Size: 6x6
- 5. Color: Stereo Grey VL 73

C. CT-3 Quarry Tile: (Kitchen)

- 1. Material: Quarry
- 2. Pattern: Match Existing
- 3. Size: 6x6 (Match Existing)
- 4. Color: Red Blaze Match Existing

D. Thresholds:

- 1. 3x32 Bullnose Trim installed so that the bullnose edge does not extend beyond the center of the door.

2.04 GROUTING MATERIALS:

A. Comply with pertinent recommendations contained in the Tile Council of America "Handbook for Ceramic Tile Installation" in colors selected by the Architect from standard colors available from the approved manufacturers.

B. Non-Staining Epoxy Grout:

- 1. Provide an engineered non-staining epoxy grout system for interior use which, upon curing, is resistant to staining, moisture, mildew, cracking, crazing, and shrinking.
- 2. Secure the Architect's specific approval of the proposed product prior to use.
- 3. Colors: As selected by Architect from manufacturer's standard colors.

2.05 SETTING MATERIALS:

A. Dry Set:

1. Provide a commercially prepared mixture of Portland cement, sand, and additives imparting water-retentivity, for use as a bond coat for setting tile in wet and dry applications.

2.06 ACCESSORIES:

A. Tiled Edge:

1. Anodized aluminum tile wall edge similar or equal to Schulter Rondec-DB, satin anodized aluminum finish.

2.07 OTHER MATERIALS:

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.01 INSPECTION OF SURFACES:

A. Inspection:

1. Examine surfaces to receive ceramic tile, settling beds, or accessories before tile installation begins for:
  - a.) Defects of conditions adversely affecting quality and execution of tile installation.
  - b.) Deviations beyond allowable tolerance of surfaces to receive tile:
    - (1) Dry-set - Maximum variation in vertical surfaces 1/4 inch in 8 feet.
  - c.) Subcontractor is to notify Contractor and A/E in writing of any surfaces that are not ready to receive ceramic tile, and he will then be responsible to correct, at no cost to the Owner, any defective ceramic tile work attributed to improperly prepared sub-surfaces.
2. Grounds, anchors, plug, hangers, bucks, electrical and mechanical work in or behind tile to be installed prior to processing with tile work.

3.02 INSTALLATION:

- A. Ceramic tile - Prepare surface, fit, set, or bond, grout and clean in accordance with applicable requirements of ANSI Standards for setting method specified, except as otherwise noted.
- B. As recommended by Tile Council of American Handbook - latest edition.

3.03 CLEAN UP:

- A. Remove all debris.
- B. Clean and make all ceramic tile work acceptable to the A/E and/or Owner, according to manufacturer's recommendations.

END OF SECTION

## SECTION 09513

### ACOUSTICAL TILE CEILINGS

#### PART 1 – GENERAL

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all SECTIONS within DIVISION 1 – GENERAL REQUIREMENTS which are hereby made a part of this section of Specifications.

#### 1.01 DESCRIPTION

- A. Work Included: Provide U.L.-approved fire-resistant, Class A acoustical ceiling assembly where shown on the drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

#### 1.02 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Provide identification affixed to the building materials (ceiling tiles and grid) with the Underwriters Laboratories, Inc., Test No. indicated that the product has been tested, approved and rated for compliance of requirements herein.

#### 1.03 SUBMITTALS

- A. Comply with pertinent provisions of Section 01300.
- B. Product Data: After the Contractor has received the Owner's Notice To Proceed, submit:
  - 1. Materials list of items proposed to the provided under this Section.
  - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
  - 3. Shop drawings in sufficient detail to show suspension, layout, lateral restraint, installation, anchorage, and interface of the work of this Section with the work of adjacent trades;
  - 4. Manufacturer's recommended installation procedures which, when approved by the A/E, will become the basis for accepting or rejecting actual installation procedures used on the work.

#### 1.04 PRODUCT HANDLING:

- A. Comply with pertinent provisions of Section 01600.



1.05 EXTRA STOCK:

- A. Deliver to the Owner for his use in future modifications, an extra stock of approximately 10% of each type of acoustical material installed, packaging each type of material separately, distinctly marked, and adequately protected against deterioration.

PART 2 - PRODUCTS

2.01 2.01 BASIS OF DESIGN

- A. To establish a level of quality and performance characteristics the desired specified high speed rolling overhead door assembly is based upon Armstrong Ultima Tegular Ceiling Systems. Alternate manufacturers may be considered, but are subject to compliance with the requirements specified herein, including but not limited to performance, style, characteristics, colors and warranty. Manufacturer's trade names are listed to establish a level for compliance.

2.02 ACCEPTABLE MANUFACTURERS

- A. Armstrong World Industries
- B. Celotex Corporation, Post Office Box 22502, Tampa, Florida, 33622.  
Phone: (813) 871-4543, or approved equal.
- C. USG Interiors, or approved equal.
- D. Both grid and panels are to be of one manufacturer unless otherwise approved by A/E.

2.03 ACOUSTICAL CEILING PANEL:

- A. Provide a complete system of supporting members, anchors, wall cornices, adapters for light fixtures and grilles, and accessories of every type required for a complete suspended 24x24 Beveled Tegular Edge System panels of the arrangements shown on the drawings; in color or colors selected by the Architect from standard colors of the approved manufacturer, and complying with pertinent requirements of Underwriter's Laboratories, Inc. and the governmental agencies having jurisdiction.

B. Panel Qualities

- |                                 |                       |
|---------------------------------|-----------------------|
| 1. Finish:                      | Fine Texture          |
| 2. Panel Size:                  | 24x24                 |
| 3. Edge:                        | Beveled Tegular 15/16 |
| 4. Acoustics:                   | 0.75 NRC/35 CAC       |
| 5. Color:                       | White                 |
| 6. Flame spread classification: | Class A               |
| 7. Light Reflectance:           | 90%                   |
| 8. Sag/Humidity Resistance:     | Yes                   |

- C. Secure all ceiling tiles with manufacturers ceiling clips in quantity recommended by manufacturer in conformance with U.L. Tested and approved assemblies (minimum four clips per ceiling tile).

2.04 OTHER MATERIALS: (all U.L. tested and approved for Fire Classification A assembly)

A. Ceiling Grid:

- 1. Provide U.L. Tested and Approved Grid Assembly conforming to Class A Fire Classification.

B. Cold-Rolled Channels

1. No. 16 MSG. Cold-rolled steel channels 1-1/2" deep with 1" flanges.
2. Secure to lower chord of joints, in a perpendicular direction.

C. Hanger Wires

1. No. 12 SWG Galvanized steel wire compatible with U.L. tested and approved Class A Fire Classification Assembly.
2. Twist-tie to cold-rolled channels.

D. Field verify and become familiar with the intended work prior to submitting bid.

E. Submit shop drawings and grid and tile samples to the Architect for approval.

F. Provide other materials, not specifically described but required for complete and proper installation, as selected by the Contractor, subject to approval of A/E.

G. Provide mineral wool and gypsum board smoke and fire barriers as specified on the drawings and herein, in conjunction with the work of this section.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION - GENERAL:

- A. Except as modified by requirements of governmental agencies having jurisdiction, recommendations of the manufacturer as approved by the A/E, or specific directions of the A/E, installation shall be in accordance with ASTM C636 and the pertinent UL design requirements.
- B. Lateral Bracing:
1. Provide lateral bracing as required by pertinent codes and regulations.
  2. Secure lateral bracing to structural members. Secure at right angles to the direction of the partition and four ways in large ceiling areas.
- C. Provide minimum of four (4) hold-down clips for each ceiling panel and additional clips when so required by governmental agencies having jurisdiction if not otherwise specified elsewhere, herein.
- D. Make all grid level within a tolerance of one-in-1000 and straight within a tolerance of one-in-1000.

3.03 INSTALLATION OF ACOUSTICAL MATERIALS:

- A. Install acoustical ceiling boards so linearity of facing is as directed by the A/E.

### 3.04 CLEANING UP

- A. In addition to other stipulated requirements for cleaning, completely remove finger prints and traces of soil from the surfaces of grid and acoustical materials, using only those cleaning materials recommended for the purpose by the manufacturer of the material being cleaned.

END OF SECTION

## SECTION 09651

### RESILIENT TILE FLOORING

#### PART 1 - GENERAL

##### 1.01 SUMMARY

###### A. Section Includes:

1. Resilient tile flooring and rubber cove base found in the drawings and schedules of the contract that meet the requirements of this section for installation with surface flooring.

##### 1.02 SUBMITTALS

A. Product Data: Submit manufacturer's published technical data describing materials, construction and recommended installation instructions. Submit technical data and installation instructions for each adhesive material.

B. Maintenance Instructions: Submit manufacturer's recommendations for maintenance, care and cleaning of base.

C. Samples: Submit Samples of top set base in each available color. Following color selections, submit Samples, not less than 12 inches long of each selected color and type. Submit pint cans of each type adhesive.

D. Maintenance Materials: Before Substantial Completion, deliver at least 50 lineal feet and five outside corner units of each color of rubber base installed. Deliver the materials in unopened factory containers or in sealed cartons with labels identifying the contents, matching installed materials. Include unopened cans of adhesives adequate to install the maintenance materials.

E. Warranty: Provide manufacturer's warranty certificate.

##### 1.03 QUALITY ASSURANCE

A. Qualifications of Installer: Minimum five years experience in successfully installing the same or similar flooring materials.

B. Comply with the following as a minimum requirement:

1. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM F1861: Standard Specification for Resilient Wall Base.
3. ASTM E 648: Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

4. ASTM E 84: Class II (26-75)
5. ASTM F 1861: Conforms
6. UL 992: <2.0
7. Chemically based products such as sealers, primers, fillers, adhesives, etc. must be approved by Owner's Office of Environmental Health and Safety (OEHS).
8. Each selected color and configuration shall be from same dye lot and color.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Materials shall be delivered to the Project site in original unopened manufacturer's packaging clearly labeled with manufacturer's name and project name.
- B. Store materials inside, sheltered from extreme hot or cold temperatures. Place the material on a smooth level floor or where there is uniform solid support in a clean, dry well-ventilated area. Unstack the pallets. The long-term storage temperature must be maintained between 65°F (18°C) and 85°F (29°C). Protect adhesive and flooring material from freezing, extreme heat and direct sun exposure.
- C. Acclimatize the subfloor, all flooring material and adhesive for 48 hours before, during and after the installation by maintaining the room temperature between 65°F (18°C) and 85°F (29°C). The pallets should be unstacked 24 hours prior to use.
- D. Maintain the room temperature between 65°F (18°C) and 85°F (29°C). Protect the material from direct sources of heat such as air vents and other types of heaters.

1.05 PROJECT CONDITIONS

- A. Ventilation and Temperature: Verify areas that are to receive rubber base are ventilated to remove fumes from installation materials, and areas are within temperature range recommended by the various material manufactures for site installation conditions.

1.06 WARRANTY

- A. Manufacturer shall provide a five year material warranty.
- B. Installer shall provide a two year fabrication and installation warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. To establish a level of quality and performance characteristics desired the specified new resilient tile flooring and rubber cove base is based upon Mohawk Group, 160 S. Industrial Blvd, Calhoun, GA 30701, (tel) 800-241-4494. [www.mohawkgroup.com](http://www.mohawkgroup.com) or approved equal. Alternate manufacturers may be considered, but are subject to compliance with the requirements specified herein, including but not limited to performance characteristics, colors and warranty.

2.02 MATERIALS

- A. Luxury Vinyl Tile Flooring (LVT): Complies with ASTM F1700, Class III, Type A – Smooth, Type B – Embossed.
  - 1. Style Name: Large and Local Reforestation C0188
  - 2. Product Type: Glue Down LVT
  - 3. Overall Thickness: 4.5 mm (0.18")
  - 4. Wear Layer: 20 mil (0.51 mm)
  - 5. Finish: M-Force Ultra
  - 6. Size: 234.95 mm x 1498.6 mm (actual)  
9.25" W x 59" L (nominal)
  - 7. Installation Method: Glue Down
  
- B. Rubber Cove Base:
  - 1. Style Name: Rubber Cove Base C0116
  - 2. Gauge: 1/8"
  - 3. Size: 120' Length Rolls, 4" Height
  - 4. Installation Method: Glue
  
- C. LVT Adhesive:
  - 1. M99 Adhesive (up to 99% in-situ RH and a pH of 12.0)
  - 2. M95.0 Adhesive (up to 95% in-situ RH and a pH of 8 - 10.0)
  - 3. M700 Adhesive (up to 90% in-situ RH and a pH of 7 – 9)
  
- D. Rubber cove Base Adhesive:
  - 1. M45 Cove Base Adhesive Cartridge

PART 3 - EXECUTION

3.01 COORDINATION

- A. Coordinate the Work of this section with other sections to provide a level, smooth and clean finish surfaces to receive rubber base.

3.02 EXAMINATION

- A. Field verify dimensions and other conditions affecting the Work of this section before commencing the Work of this section.
- B. Before Work is started, examine surfaces that are to receive resilient flooring and rubber cove base. Deficiencies shall be corrected before starting the Work of this section. Examine the subfloor before installation to ensure that the surface is clean, dry, smooth, structurally sound and free from foreign substances that may adversely affect adhesion or cause discoloration. Furthermore, ensure that the subfloor is free of paint, varnish, adhesive, oil, grease, solvent and other foreign substances, including treatment compounds, sealers and curing compounds that may adversely affect adhesion or alter the appearance or durability of the rubber flooring.

3.03 PREPARATION

- A. Do not start preparation until adjacent concrete floor slabs are at least 90 days old and finish flooring is installed.
- B. Install resilient floor and rubber cove base when ambient temperature is 65 degrees F. or higher.
- C. Level all rough surfaces and fill cracks and marks with a Portland cement-based patching compound modified with latex.
- D. Mechanically remove all surface contaminants such as paint, oil, grease, varnish, adhesive as well as various other products such as treatment compounds.
- E. Ensure Moisture, Relative Humidity and pH tests have all been conducted and measurements meet manufacturer's recommendations.

3.04 INSTALLATION

- A. Install the flooring according to manufacturer's installation instructions. Use the tools, adhesives, trowel types and procedures recommended in the instructions.
- B. Acclimatize the subfloor, all flooring material and adhesive for 48 hours before, during and after the installation by maintaining the room temperature between 65°F (18°C) and 85°F (29°C). Afterwards, maintain the temperature between 65°F (18°C) and 85°F (29°C)..
- D. Base and outside corners shall be rolled with a seam roller before adhesive sets.

3.05 CLEANING

- A. Maintain surfaces of base clean as installation progresses. Clean rubber base when sufficiently seated and remove foreign substances.
- B. Clean adjacent surfaces of adhesive or other defacement. Replace damaged and/or defective Work to the specified condition.

3.06 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.07 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION



**SECTION 09290**  
**GYPSUM WALL 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.

**1.3 ACTION SUBMITTALS**

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

- B. Sustainable Design Submittals:

- 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- 2. Product Certificates: For materials manufactured within 100 miles of Project, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each raw material.
- 3. Product Data: For adhesives and sealants, indicating VOC content.
- 4. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.
- 5. Laboratory Test Reports: For ceiling and wall materials, indicating compliance with requirements for low-emitting materials.

- C. Samples: For the following products:

- 1. Trim Accessories: Full-size Sample in 12-inch long length for each trim accessory indicated.
- 2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

- D. Samples for Initial Selection: For each type of trim accessory indicated.

- E. Samples for Verification: For the following products:

- 1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.
- 2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

#### 1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
  - 1. Build mockups for the following:
    - a. Each level of gypsum board finish indicated for use in exposed locations.
    - b. Each texture finish indicated.
  - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
  - 3. Simulate finished lighting conditions for review of mockups.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.5 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.

#### 1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. 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.
- C. Ceiling and wall materials shall comply with the 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 GYPSUM BOARD, GENERAL

- A. Regional Materials: Products shall be manufactured within 100 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.
- B. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

## 2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C 1396/C 1396M.
  - 1. Basis-of-Design: To establish a level of quality and performance characteristics the desired specified gypsum board is based upon USG Corporation; USG Sheetrock® Brand Gypsum Panels. Alternate manufacturers may be considered, but are subject to compliance with the requirements specified herein, including but not limited to performance, style, characteristics, colors and warranty. Manufacturer's trade names are listed to establish a level for compliance.
  - 2. Subject to compliance with requirements, provide USG Corporation; USG Sheetrock® Brand Gypsum Panels or approved equal.
  - 3. Thickness: Match existing.
  - 4. Long Edges: Tapered

## 2.4 METAL STUDS

- A. Metal Studs:
  - 1. At interior metal stud partitions and ceilings, unless otherwise shown on the drawings, provide standard punched steel studs of 20-gauge, hot-dip galvanized; size as shown on the drawings.
  - 2. At interior metal stud partitions and ceilings, unless otherwise shown on the drawings, provide standard punched steel studs of 20-gauge, hot-dip galvanized; size as shown on the drawings.
  - 3. Use only one type throughout the work, unless otherwise shown on the drawings or specifically approved in advance by the A/E.
  - 4. At interior metal stud partitions and ceilings, unless otherwise shown on the drawings, provide standard punched steel studs of 20-gauge, hot-dip galvanized; size as shown on the drawings.
- B. Metal header assemblies:
  - 1. Provide punched steel studs of 18 gauge, hot-dip galvanized; size as shown on the drawings.
- C. Metal Studs to each end of metal header assembly:
  - 1. Provide punched steel studs of 18 gauge, hot-dip galvanized; size as shown on the drawings.
- D. Metal Furring:

1. Provide standard steel furring channels of 22 gauge, hot-dip galvanized; size as shown on the drawings.

E. Metal Runner:

1. Width of studs by 1" high × standard length.
2. Required at head and floor and as header over doors.

F. Accessories: Provide all accessories including, but not necessarily limited to, tracks, clips, anchors, fastening devices, sound attenuation pencil rods, and resilient clips, and other accessories required for a complete and proper installation, and as recommended by the manufacturer of the steel studs used.

## 2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
2. Shapes:
  - a. Cornerbead.
  - b. Bullnose bead.
  - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
  - d. L-Bead: L-shaped; exposed long flange receives joint compound.
  - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
  - f. Expansion (control) joint.
  - g. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Fry Reglet Corporation.
  - b. Gordon, Inc.
  - c. Pittcon Industries.
  - d. Schluter Systems
2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

## 2.6 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, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
  - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-tape and all-purpose compound.
    - a. Use setting-type compound for installing paper-faced metal trim accessories.
  - 3. Fill Coat: For second coat, use setting-type, sandable topping and all-purpose compound.
  - 4. Finish Coat: For third coat, use setting-type, sandable topping and all-purpose compound.
  - 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

## 2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
  - 1. Use screws complying with ASTM C 954 for fastening panels to steel members, masonry and wood members from 0.033- to 0.112-inch thick.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install 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.

- 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. 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 instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

### 3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  - 1. Wallboard Type: Vertical surfaces unless otherwise indicated.
  - 2. Type X: Where required for fire-resistance-rated assembly.
- B. Single-Layer Application:
  - 1. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
  - 2. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
  - 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

### 3.4 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  - 1. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
    - a. Primer and its application to surfaces are specified in Section 09910 "Painting."
    - b. Finish to match existing.

### 3.5 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, or 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 09290

## SECTION 09310

### CERAMIC TILE

#### PART 1 – GENERAL

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all SECTIONS within DIVISION 1 – GENERAL REQUIREMENTS which are hereby made a part of this section of Specifications.

#### 1.01 DESCRIPTION:

- A. Provide ceramic tile and all related materials and accessories where indicated on the drawings and herein and as required for a complete and proper job.

B. Related Work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

#### 1.02 QUALITY ASSURANCE:

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

#### 1.03 SUBMITTALS:

- A. Comply with pertinent provisions of Section 01300.

B. Samples - Submit in duplicate:

1. Ceramic wall, floor & base tiles.
2. Trim Shapes - each color, type, and shape
3. Accessories - each color, type and style

C. Certificates:

1. Master Grade Certificate:

- a) Conform to ANSI A137-1
- b) Furnish for standard grade tiles
- c) State grade, kind of tile, identification marks for tile packages, and name and location of project.
- d) Issued and signed by manufacturer when tile is shipped.
- e) Furnish the Architect and Owner each with one (1) copy of all certificates issued.

2. Manufacturers of mortars, adhesives, and grouts to certify that materials:

- a) Are suitable for intended use,
- b) Meet or exceed the standards of American National Standards Institute (ANSI) and Tile Council of America Inc. (T.C.A.)

- D. Manufacturer's Instruction - Furnish manufacturer's instructions for the use of Tile Council of America (T.C.A.)



- E. Extra Stock - 12 pieces of trim for every color - 25 pieces of field wall tile and floor tile for every color and shape.
  - 1. Neatly package, label and deliver to the Owner all extra stock specified at the completion of all work required by this Section.

Note: Bidders are to provide the greater of the value of Extra stock noted above and in Part 1.07 of this specification.

#### 1.04 PRODUCT LABELING, DELIVERY & HANDLING:

- A. Deliver materials in manufacturer's original sealed containers.
  - 1. Labels legible and intact, identifying brand name and contents.
  - 2. Tile cartons grade-sealed by manufacturer in accordance with ANSI A137.
  - 3. Grade-seals unbroken.
  - 4. Manufactured mortars and grouts shall contain hallmarks certifying compliance with reference standards and be the types recommended by the tile manufacturer for application.
  - 5. Adhesives in containers labeled with hallmarks certifying compliance with reference standards.
- B. Deliver mastic grout ready for use.
- C. Deliver dry set mortar in sealed, moisture-proof containers.
- D. Store materials under cover in manner to prevent damage or contamination.
- E. All materials will be stored in an area where the temperature does not go below 50°F at any time. Materials stored at lower temperatures will not be used on this project.

#### 1.05 JOB CONDITIONS:

- A. Environmental - Set and grout tile when ambient temperature is at least 50°F (10°C) and rising.
- B. Protection - Protect adjoining work surfaces before tile work begins.

#### 1.06 EXTRA STOCK:

- A. Deliver to the Owner for his use in future modifications, an extra stock of approximately 10% of each color and pattern in each material installed under this Section, packaging each type of material separately, distinctly marked, and adequately protected against deterioration.

Note: Bidders are to provide the greater of the value of Extra stock noted above and in Part 1.07 of this specification.

## PART 2 – PRODUCTS

### 2.01 BASIS OF DESIGN

- A. To establish a level of quality and performance characteristics the desired specified tile is based upon Daltile Corporation Tile. Alternate manufacturers may be considered, but are subject to compliance with the requirements specified herein, including but not limited to

performance, style, characteristics, colors and warranty. Manufacturer's trade names are listed to establish a level for compliance.

2.02 MANUFACTURER:

- B. American Olean Tile Co.
- C. Roca Tile USA.
- D. Or Approved Equal

2.03 CERAMIC MOSAICS:

A. CT-1 (Ceramic Tile – Type 1) Glazed Porcelain Tile: (Water Closet Floor)

- 1. Material: Glazed Porcelain
- 2. Series: Volume 1.0
- 3. Pattern: Running Bond – Long Length Horizontal
- 4. Size: 12x24
- 5. Color: Intensity Pebble VL 72
- 6. Features: Rectangle

B. CT-2 (Ceramic Tile – Type 2) Glazed Porcelain Tile: (Water Closet Walls)

- 1. Material: Glazed Porcelain
- 2. Series: Volume 1.0
- 3. Pattern: Stack Bond
- 4. Size: 6x6
- 5. Color: Stereo Grey VL 73

C. CT-3 Quarry Tile: (Kitchen)

- 1. Material: Quarry
- 2. Pattern: Match Existing
- 3. Size: 6x6 (Match Existing)
- 4. Color: Red Blaze Match Existing

D. Thresholds:

- 1. 3x32 Bullnose Trim installed so that the bullnose edge does not extend beyond the center of the door.

2.04 GROUTING MATERIALS:

A. Comply with pertinent recommendations contained in the Tile Council of America "Handbook for Ceramic Tile Installation" in colors selected by the Architect from standard colors available from the approved manufacturers.

B. Non-Staining Epoxy Grout:

- 1. Provide an engineered non-staining epoxy grout system for interior use which, upon curing, is resistant to staining, moisture, mildew, cracking, crazing, and shrinking.
- 2. Secure the Architect's specific approval of the proposed product prior to use.
- 3. Colors: As selected by Architect from manufacturer's standard colors.

2.05 SETTING MATERIALS:

A. Dry Set:

1. Provide a commercially prepared mixture of Portland cement, sand, and additives imparting water-retentivity, for use as a bond coat for setting tile in wet and dry applications.

2.06 ACCESSORIES:

A. Tiled Edge:

1. Anodized aluminum tile wall edge similar or equal to Schulter Rondec-DB, satin anodized aluminum finish.

2.07 OTHER MATERIALS:

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.01 INSPECTION OF SURFACES:

A. Inspection:

1. Examine surfaces to receive ceramic tile, settling beds, or accessories before tile installation begins for:
  - a.) Defects of conditions adversely affecting quality and execution of tile installation.
  - b.) Deviations beyond allowable tolerance of surfaces to receive tile:
    - (1) Dry-set - Maximum variation in vertical surfaces 1/4 inch in 8 feet.
  - c.) Subcontractor is to notify Contractor and A/E in writing of any surfaces that are not ready to receive ceramic tile, and he will then be responsible to correct, at no cost to the Owner, any defective ceramic tile work attributed to improperly prepared sub-surfaces.
2. Grounds, anchors, plug, hangers, bucks, electrical and mechanical work in or behind tile to be installed prior to processing with tile work.

3.02 INSTALLATION:

- A. Ceramic tile - Prepare surface, fit, set, or bond, grout and clean in accordance with applicable requirements of ANSI Standards for setting method specified, except as otherwise noted.
- B. As recommended by Tile Council of American Handbook - latest edition.

3.03 CLEAN UP:

- A. Remove all debris.
- B. Clean and make all ceramic tile work acceptable to the A/E and/or Owner, according to manufacturer's recommendations.

END OF SECTION

## SECTION 09513

### ACOUSTICAL TILE CEILINGS

#### PART 1 – GENERAL

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all SECTIONS within DIVISION 1 – GENERAL REQUIREMENTS which are hereby made a part of this section of Specifications.

#### 1.01 DESCRIPTION

- A. Work Included: Provide U.L.-approved fire-resistant, Class A acoustical ceiling assembly where shown on the drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

#### 1.02 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Provide identification affixed to the building materials (ceiling tiles and grid) with the Underwriters Laboratories, Inc., Test No. indicated that the product has been tested, approved and rated for compliance of requirements herein.

#### 1.03 SUBMITTALS

- A. Comply with pertinent provisions of Section 01300.
- B. Product Data: After the Contractor has received the Owner's Notice To Proceed, submit:
  - 1. Materials list of items proposed to the provided under this Section.
  - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
  - 3. Shop drawings in sufficient detail to show suspension, layout, lateral restraint, installation, anchorage, and interface of the work of this Section with the work of adjacent trades;
  - 4. Manufacturer's recommended installation procedures which, when approved by the A/E, will become the basis for accepting or rejecting actual installation procedures used on the work.

#### 1.04 PRODUCT HANDLING:

- A. Comply with pertinent provisions of Section 01600.

1.05 EXTRA STOCK:

- A. Deliver to the Owner for his use in future modifications, an extra stock of approximately 10% of each type of acoustical material installed, packaging each type of material separately, distinctly marked, and adequately protected against deterioration.

PART 2 - PRODUCTS

2.01 2.01 BASIS OF DESIGN

- A. To establish a level of quality and performance characteristics the desired specified high speed rolling overhead door assembly is based upon Armstrong Ultima Tegular Ceiling Systems. Alternate manufacturers may be considered, but are subject to compliance with the requirements specified herein, including but not limited to performance, style, characteristics, colors and warranty. Manufacturer's trade names are listed to establish a level for compliance.

2.02 ACCEPTABLE MANUFACTURERS

- A. Armstrong World Industries
- B. Celotex Corporation, Post Office Box 22502, Tampa, Florida, 33622.  
Phone: (813) 871-4543, or approved equal.
- C. USG Interiors, or approved equal.
- D. Both grid and panels are to be of one manufacturer unless otherwise approved by A/E.

2.03 ACOUSTICAL CEILING PANEL:

- A. Provide a complete system of supporting members, anchors, wall cornices, adapters for light fixtures and grilles, and accessories of every type required for a complete suspended 24x24 Beveled Tegular Edge System panels of the arrangements shown on the drawings; in color or colors selected by the Architect from standard colors of the approved manufacturer, and complying with pertinent requirements of Underwriter's Laboratories, Inc. and the governmental agencies having jurisdiction.

B. Panel Qualities

- |                                 |                       |
|---------------------------------|-----------------------|
| 1. Finish:                      | Fine Texture          |
| 2. Panel Size:                  | 24x24                 |
| 3. Edge:                        | Beveled Tegular 15/16 |
| 4. Acoustics:                   | 0.75 NRC/35 CAC       |
| 5. Color:                       | White                 |
| 6. Flame spread classification: | Class A               |
| 7. Light Reflectance:           | 90%                   |
| 8. Sag/Humidity Resistance:     | Yes                   |

- C. Secure all ceiling tiles with manufacturers ceiling clips in quantity recommended by manufacturer in conformance with U.L. Tested and approved assemblies (minimum four clips per ceiling tile).

2.04 OTHER MATERIALS: (all U.L. tested and approved for Fire Classification A assembly)

A. Ceiling Grid:

- 1. Provide U.L. Tested and Approved Grid Assembly conforming to Class A Fire Classification.

B. Cold-Rolled Channels

1. No. 16 MSG. Cold-rolled steel channels 1-1/2" deep with 1" flanges.
2. Secure to lower chord of joints, in a perpendicular direction.

C. Hanger Wires

1. No. 12 SWG Galvanized steel wire compatible with U.L. tested and approved Class A Fire Classification Assembly.
2. Twist-tie to cold-rolled channels.

D. Field verify and become familiar with the intended work prior to submitting bid.

E. Submit shop drawings and grid and tile samples to the Architect for approval.

F. Provide other materials, not specifically described but required for complete and proper installation, as selected by the Contractor, subject to approval of A/E.

G. Provide mineral wool and gypsum board smoke and fire barriers as specified on the drawings and herein, in conjunction with the work of this section.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION - GENERAL:

- A. Except as modified by requirements of governmental agencies having jurisdiction, recommendations of the manufacturer as approved by the A/E, or specific directions of the A/E, installation shall be in accordance with ASTM C636 and the pertinent UL design requirements.
- B. Lateral Bracing:
1. Provide lateral bracing as required by pertinent codes and regulations.
  2. Secure lateral bracing to structural members. Secure at right angles to the direction of the partition and four ways in large ceiling areas.
- C. Provide minimum of four (4) hold-down clips for each ceiling panel and additional clips when so required by governmental agencies having jurisdiction if not otherwise specified elsewhere, herein.
- D. Make all grid level within a tolerance of one-in-1000 and straight within a tolerance of one-in-1000.

3.03 INSTALLATION OF ACOUSTICAL MATERIALS:

- A. Install acoustical ceiling boards so linearity of facing is as directed by the A/E.

3.04 CLEANING UP

- A. In addition to other stipulated requirements for cleaning, completely remove finger prints and traces of soil from the surfaces of grid and acoustical materials, using only those cleaning materials recommended for the purpose by the manufacturer of the material being cleaned.

END OF SECTION

## SECTION 09651

### RESILIENT TILE FLOORING

#### PART 1 - GENERAL

##### 1.01 SUMMARY

###### A. Section Includes:

1. Resilient tile flooring and rubber cove base found in the drawings and schedules of the contract that meet the requirements of this section for installation with surface flooring.

##### 1.02 SUBMITTALS

A. Product Data: Submit manufacturer's published technical data describing materials, construction and recommended installation instructions. Submit technical data and installation instructions for each adhesive material.

B. Maintenance Instructions: Submit manufacturer's recommendations for maintenance, care and cleaning of base.

C. Samples: Submit Samples of top set base in each available color. Following color selections, submit Samples, not less than 12 inches long of each selected color and type. Submit pint cans of each type adhesive.

D. Maintenance Materials: Before Substantial Completion, deliver at least 50 lineal feet and five outside corner units of each color of rubber base installed. Deliver the materials in unopened factory containers or in sealed cartons with labels identifying the contents, matching installed materials. Include unopened cans of adhesives adequate to install the maintenance materials.

E. Warranty: Provide manufacturer's warranty certificate.

##### 1.03 QUALITY ASSURANCE

A. Qualifications of Installer: Minimum five years experience in successfully installing the same or similar flooring materials.

B. Comply with the following as a minimum requirement:

1. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM F1861: Standard Specification for Resilient Wall Base.
3. ASTM E 648: Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.



4. ASTM E 84: Class II (26-75)
5. ASTM F 1861: Conforms
6. UL 992: <2.0
7. Chemically based products such as sealers, primers, fillers, adhesives, etc. must be approved by Owner's Office of Environmental Health and Safety (OEHS).
8. Each selected color and configuration shall be from same dye lot and color.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Materials shall be delivered to the Project site in original unopened manufacturer's packaging clearly labeled with manufacturer's name and project name.
- B. Store materials inside, sheltered from extreme hot or cold temperatures. Place the material on a smooth level floor or where there is uniform solid support in a clean, dry well-ventilated area. Unstack the pallets. The long-term storage temperature must be maintained between 65°F (18°C) and 85°F (29°C). Protect adhesive and flooring material from freezing, extreme heat and direct sun exposure.
- C. Acclimatize the subfloor, all flooring material and adhesive for 48 hours before, during and after the installation by maintaining the room temperature between 65°F (18°C) and 85°F (29°C). The pallets should be unstacked 24 hours prior to use.
- D. Maintain the room temperature between 65°F (18°C) and 85°F (29°C). Protect the material from direct sources of heat such as air vents and other types of heaters.

1.05 PROJECT CONDITIONS

- A. Ventilation and Temperature: Verify areas that are to receive rubber base are ventilated to remove fumes from installation materials, and areas are within temperature range recommended by the various material manufactures for site installation conditions.

1.06 WARRANTY

- A. Manufacturer shall provide a five year material warranty.
- B. Installer shall provide a two year fabrication and installation warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. To establish a level of quality and performance characteristics desired the specified new resilient tile flooring and rubber cove base is based upon Mohawk Group, 160 S. Industrial Blvd, Calhoun, GA 30701, (tel) 800-241-4494. [www.mohawkgroup.com](http://www.mohawkgroup.com) or approved equal. Alternate manufacturers may be considered, but are subject to compliance with the requirements specified herein, including but not limited to performance characteristics, colors and warranty.

2.02 MATERIALS

- A. Luxury Vinyl Tile Flooring (LVT): Complies with ASTM F1700, Class III, Type A – Smooth, Type B – Embossed.
  - 1. Style Name: Large and Local Reforestation C0188
  - 2. Product Type: Glue Down LVT
  - 3. Overall Thickness: 4.5 mm (0.18")
  - 4. Wear Layer: 20 mil (0.51 mm)
  - 5. Finish: M-Force Ultra
  - 6. Size: 234.95 mm x 1498.6 mm (actual)  
9.25" W x 59" L (nominal)
  - 7. Installation Method: Glue Down
- B. Rubber Cove Base:
  - 1. Style Name: Rubber Cove Base C0116
  - 2. Gauge: 1/8"
  - 3. Size: 120' Length Rolls, 4" Height
  - 4. Installation Method: Glue
- C. LVT Adhesive:
  - 1. M99 Adhesive (up to 99% in-situ RH and a pH of 12.0)
  - 2. M95.0 Adhesive (up to 95% in-situ RH and a pH of 8 - 10.0)
  - 3. M700 Adhesive (up to 90% in-situ RH and a pH of 7 – 9)
- D. Rubber cove Base Adhesive:
  - 1. M45 Cove Base Adhesive Cartridge

PART 3 - EXECUTION

3.01 COORDINATION

- A. Coordinate the Work of this section with other sections to provide a level, smooth and clean finish surfaces to receive rubber base.

3.02 EXAMINATION

- A. Field verify dimensions and other conditions affecting the Work of this section before commencing the Work of this section.
- B. Before Work is started, examine surfaces that are to receive resilient flooring and rubber cove base. Deficiencies shall be corrected before starting the Work of this section. Examine the subfloor before installation to ensure that the surface is clean, dry, smooth, structurally sound and free from foreign substances that may adversely affect adhesion or cause discoloration. Furthermore, ensure that the subfloor is free of paint, varnish, adhesive, oil, grease, solvent and other foreign substances, including treatment compounds, sealers and curing compounds that may adversely affect adhesion or alter the appearance or durability of the rubber flooring.

3.03 PREPARATION

- A. Do not start preparation until adjacent concrete floor slabs are at least 90 days old and finish flooring is installed.
- B. Install resilient floor and rubber cove base when ambient temperature is 65 degrees F. or higher.
- C. Level all rough surfaces and fill cracks and marks with a Portland cement-based patching compound modified with latex.
- D. Mechanically remove all surface contaminants such as paint, oil, grease, varnish, adhesive as well as various other products such as treatment compounds.
- E. Ensure Moisture, Relative Humidity and pH tests have all been conducted and measurements meet manufacturer's recommendations.

3.04 INSTALLATION

- A. Install the flooring according to manufacturer's installation instructions. Use the tools, adhesives, trowel types and procedures recommended in the instructions.
- B. Acclimatize the subfloor, all flooring material and adhesive for 48 hours before, during and after the installation by maintaining the room temperature between 65°F (18°C) and 85°F (29°C). Afterwards, maintain the temperature between 65°F (18°C) and 85°F (29°C)..
- D. Base and outside corners shall be rolled with a seam roller before adhesive sets.

3.05 CLEANING

- A. Maintain surfaces of base clean as installation progresses. Clean rubber base when sufficiently seated and remove foreign substances.
- B. Clean adjacent surfaces of adhesive or other defacement. Replace damaged and/or defective Work to the specified condition.

3.06 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.07 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

## SECTION 09910

### PAINTING

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. Paint all surfaces as indicated herein and/or as required and as intended for a complete and proper job.
- B. Related Work:
  - 1. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

##### 1.02 QUALITY ASSURANCE:

- A. Include on Label of Containers:
  - 1. Manufacturer's name;
  - 2. Type of paint;
  - 3. Manufacturer's stock number;
  - 4. Color;
  - 5. Instructions for reducing, where applicable;
  - 6. Label analysis;
  - 7. Federal Specification number
- B. Sampling of Materials:
  - 1. When requested by the A/E, obtain test samples from materials stored at project site or source of supply.
  - 2. Select samples at random from sealed containers.
- C. Fungus Control: Organic coating shall show no fungus growth when tested as specified in Federal Test Method Standard 141, Method 6271.1.
- D. Field Quality Control:
  - 1. Request review of first finished room, space, or item of each color scheme required by A/E for color, texture, and workmanship.
  - 2. Use first acceptable building component as project standard for each color scheme.
  - 3. For spray application, paint surface not smaller than 100 sq. ft. as project standard.
- E. Paint Coordination:
  - 1. Provide finish coats, which are compatible with the prime coats actually used.
  - 2. Review other sections of these specifications as required verifying the prime coats to be used and assuring compatibility of the total coating system for the various substrata.

3. Upon request, furnish information of the characteristics of the specific finish materials to assure that compatible prime coats are used.
4. Provide barrier coats over noncompatible primers, or remove the primer and re-prime as required.
5. Prior to ordering paint materials, notify the Architect in writing of anticipated problems in using the specified coating systems over existing and prime-coatings.

1.03 SUBMITTALS:

- A. Color samples;
- B. Manufacturer's literature and recommendations, including flame spread ratings, fuel contribution and smoke density factors, including each wood specimen to be used.
- C. Prototype:
  1. Completely paint a specified portion of one building to serve as a prototype for all painting. Do not proceed further until approved in writing, by the Architect.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver sealed containers with labels legible and intact.
- B. Store only acceptable project materials on project site.
- C. Store in a suitable location.
- D. Restrict storage to paint materials and related equipment.
- E. Comply with health and fire regulations.
- F. Comply with pertinent other provisions of Section 01600.

1.05 JOB CONDITIONS:

- A. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be applied.
- B. Do not apply finish in areas where dust is being generated.
- C. Cover or otherwise protect finished work of other trades and surfaces not being painted concurrently or not to be painted.
- D. Do not apply solvent-thinned paints when the temperature of surfaces to be painted and the surrounding air temperatures are below 45°F, unless otherwise permitted by the manufacturer's printed instructions as approved by the A/E.
- E. Weather Conditions:
  1. Do not apply paint when the relative humidity exceeds 85%; or to damp or wet surfaces, unless otherwise permitted by the manufacturer's printed instructions as approved by the A/E.

1.06 EXTRA STOCK:

- A. Upon completion of the work of this section, deliver to the Owner, as extra stock equaling 1 gallon of each color, type, and gloss of paint used in the work, tightly sealing each container, and clearly labeling with contents and location where used.
- B. Each container shall be clearly marked as to the type of paint or stain, color name (and number), manufacturer's name, and where used. Said containers shall be clean of excessive paint and have airtight covers.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

- A. To establish a level of quality and performance characteristics desired the specified paint is based upon Sherwin Williams or approved equal. Alternate manufacturers may be considered, but are subject to compliance with the requirements specified herein, including but not limited to performance characteristics, colors and warranty.
  - 1. Glidden Coatings
  - 2. Pratt & Lambert
- B. Materials selected for coating systems for each type surface shall be the product of a single manufacturer, unless otherwise indicated by the A/E.
- C. Where products are proposed other than those specified by name and number in the painting schedule, provide submittals and a new painting schedule compiled in the same format used for the painting schedule in this section.
- D. Undercoats and Thinners:
  - 1. Provide undercoat paint produced by the same manufacturer as the finish coat.
  - 2. Use only the thinners recommended by the paint manufacturer, and use only to the recommended limits.
  - 3. Insofar as practicable, use undercoat, finish coat, and thinner materials as parts of a unified system of paint finish.

2.02 MATERIALS:

- A. Paint shall be first quality of types and brands herein specified. The term "paint" as used herein includes enamels, primers, epoxy, fillers, transparent coatings, paint emulsions, stains, varnishes, sealers, and other coatings, organic or inorganic, whether used as prime, intermediate finish coats. Paint shall be well ground and shall be of such composition that it can be easily broken up with a paddle to smooth consistency.
- B. Linseed oil, shellac, turpentine and other materials shall be of the highest quality as approved by the A/E.
- C. Tints and all other additives or thinners shall be used only as recommended by the manufacturer of the paint as approved.

2.03 COLORS:

- A. Colors of paints, including stain shades, shall be from manufacturer's standard colors. Architect shall select all colors.
- B. Refer to 3.08 "B", Painting Schedule, herein.

2.04 MIXING AND TINTING:

- A. Deliver paints and enamels ready-mixed to job site.
- B. Accomplish job mixing and job tinting only when acceptable to the A/E.
- C. Mix only in mixing pails placed in suitably sized non-ferrous or oxide-resistant metal pans.
- D. Use tinting colors recommended by manufacturer for the specific type of finish.
- E. Fungicidal agent shall be incorporated into the paint by the manufacturer.

PART 3 - EXECUTION

3.01 INSPECTION:

- A. Examine surfaces scheduled to receive paint and finishes for conditions that will adversely affect execution, permanence, or quality of work and which cannot be put into an acceptable condition through preparatory work as included in Article 3.02 - PREPARATION OF SURFACES.
- B. Do not proceed with surface preparation or coating application until conditions are suitable for timely and proper completion of this section.

3.02 PREPARATION OF SURFACES:

A. General:

1. Perform preparation and cleaning procedures in strict accordance with the paint manufacturer's recommendations as approved by the A/E and these Specifications.
2. Remove removable items, which are in place and are not scheduled to receive paint finish, or provide surface-applied protection prior to surface preparation and painting operations.
3. Following completion of painting in each space or area, reinstall the removed items by using workers who are skilled in the necessary trades.
4. Clean each surface to be painted prior to applying paint or surface treatment. ALL SURFACES TO BE PAINTED SHALL BE HAND WASHED WITH NON-SAPONIFYING SOLUTION SUCH AS TSP UNTIL ALL TRACES OF DIRT, OIL, OR GREASE HAVE BEEN REMOVED.

B. Wood Surfaces: (when applicable)

1. Clean soiled surfaced with alcohol wash.



2. Except where rough exterior surface is specified, sand to smooth and even surface, and then vacuum off.
3. Apply specified product to all knots, pitch and resinous sapwood before priming coat is applied.
4. Fill nail holes, cracks, open joints, and other defects with oil based putty after priming coat has dried. Color to match finish color.
5. If a stain is used, provide a small test area for product compatibility. Test for color acceptance. Stains shall be allowed to dry 24 hours before re-coating. A light sanding with very fine sandpaper before application or finish shall be provided.

C. Gypsum Wallboard and Plaster:

1. Fill narrow, shallow cracks and small holes with spackling compound and/or plaster.
2. Allow to dry; sand smooth.
3. Do not raise nap of paper on wallboard.

D. Concrete and Masonry Surfaces: (when applicable)

1. Fill cracks and irregularities with Portland cement grout to provide uniform surface texture.
2. Etch with 5% solution (by weight) of muriatic acid.
3. Fill concrete masonry unit surfaces with block filler.

E. Ferrous Metal Surfaces: (when applicable)

1. Prepare surface in accordance with recommendations and directions of manufacturer with rust-inhibitive primer.
2. Featheredges of sound paint by grinding, if necessary.

F. Galvanized Metal: (when applicable)

1. Clean surface with mineral spirits to remove oily residue.
2. Dry with clean cloth.

3.03 MATERIALS PREPARATION:

A. General:

1. Mix and prepare paint materials in strict accordance with the manufacturer's recommendations as approved by the A/E.
2. When materials are not in use, store in tightly covered containers.
3. Maintain containers used in storage, mixing, and application of paint, in a clean condition, free from foreign materials and residue.

B. Stirring:

1. Stir materials before application, producing a mixture of uniform density.
2. Do not stir into the material any film, which may form on the surface, but remove the film and, if necessary, strain the material before using.

C. Preparation of Surfaces:

1. All surfaces to be painted shall be clean, dry and free of frost.
2. All wood trim shall be scraped, sanded, nailed, countersunk and puttied. All joints shall be caulked.

3.04 PAINT APPLICATION:

A. General:

1. Touch-up shop-applied prime coats which have been damaged, and touch-up bare areas prior to start of finish coats application.
2. Slightly vary the color of succeeding coats.
  - a.) Do not apply additional coats until the completed coat has been inspected and approved.
  - b.) Only the inspected and approved coats of paint will be considered in determining the number of coats applied.

B. Do not apply initial coating until moisture content of surface is within limitations recommended by paint manufacturer.

C. Apply paint enamel, stain and varnish with suitable brushes, rollers or spraying equipment.

1. Rate of application shall not exceed that as recommended by paint manufacturer for the surface involved, less 10 percent.
2. Keep brushes, rollers, and spraying equipment clean, dry, free of contaminants and suitable for the finish required.
3. Comply with recommendations of product manufacturer for drying time between succeeding coats.
4. Sand and dust between each coat to remove defects visible from a distance of 5 feet.
5. Finish coats shall be smooth, free of brush marks, streaks, laps, or pile-up of paints, and skipped or missed areas.
6. Deleted.
7. Contractor shall be responsible for following manufacturer's written instructions and warnings for all products specified or substitutes herein.

D. Leave all parts of moldings and ornamental work clean and true to detail with no undue amount of paint in corners and depressions.

E. Make edges of paint adjoining other materials or colors clean and sharp with no overlapping.

F. Refinish whole wall where portion of finish has been damaged or is not acceptable.

**G. Back prime all new wood trim.**

H. Runs on face are not permitted.

- I. Wet Areas:
  - 1. Add an approved fungicide to paints.
  - 2. For oil base paints, use 1% phenolmercuric or 4% tetrachlorophenol.
  - 3. For water emulsion and glue size surfaces, use 4% sodium tetrachlorophenate.
- J. For completed work, match the approved samples as to texture, color, and coverage. Remove, refinish, or repaint work not in compliance with the specified requirements.

### 3.05 PAINT DRYING:

- A. Allow sufficient drying time between coats, modifying the period as recommended by the materials manufacturer to suit adverse weather conditions.
- B. Consider oil-base and oleo-resinous solvent-type paint as dry for recoating when the paint feels firm, does not deform or feel sticky under moderate pressure of the thumb, and when the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

### 3.06 APPLICATION EQUIPMENT:

- A. For application of the approved paint, use only such equipment as is recommended for application of the particular paint by the manufacturer of the particular paint, and as approved by the Architect.
- B. Prior to use of application equipment, verify that the proposed equipment is actually compatible with the materials to be applied, and that the integrity of the finish will not be jeopardized by the use of the proposed equipment.
- C. Brush Applications:
  - 1. Brush out and work the base coats onto the surface in an even film.
  - 2. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, and other surface imperfections will not be acceptable.
- D. Spray Application:
  - 1. Except as specifically otherwise approved by the Architect, confine spray application to metal framework and similar surfaces where hand brush work would be inferior.
  - 2. Where spray application is used, apply each coat to provide the hiding equivalent of brush coats.
  - 3. Do not double back with spray equipment to build up film thickness of two coats in one pass.
- E. Roller Application:
  - 1. Rollers may be used on large wall and ceiling surfaces. Keep walls free of roller marks.

3.07 CLEANING:

- A. Touch up and restore finish where damaged.
- B. Remove spilled, splashed, or splattered paint from all surfaces.
- C. Do not mar surface finish of item being cleaned.
- D. Leave storage space clean and in condition required for equivalent spaces in project
- E. Cleaning up process shall proceed with progress of work.

3.08 PAINTING SCHEDULE:

- A. Surfaces not to be painted:
  - 1. Items with factory-applied final finish unless otherwise noted.
  - 2. Masonry surfaces - unless otherwise noted.
  - 3. Existing metal trim located over wood trim work such as that at certain window unit locations.
  - 4. Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, lead-coated copper, bronze, and similar finished materials unless otherwise directed.
  - 5. Do not paint over required labels or equipment identification performance rating, name, or nomenclature plates.
- B. Areas shall be painted as indicated, as directed, and as approved. The kinds of painting materials and number of coats required on various surfaces shall be as indicated in the following schedule.

NUMBER OF COATS INDICATED HEREINAFTER ARE MINIMUM. COMPLETE COVERAGE IS REQUIRED. PROVIDE ADDITIONAL COATS TO AREAS WHICH DO NOT SHOW COMPLETE COVERAGE WITH SPECIFIED COATS.

- 1. New Interior Plaster and Gypsum Board: (PT-1 Finish)
  - 1st coat: Sherwin Williams Primer
  - (2) coats: Sherwin Williams 7071 Gray Screen Latex.
- 2. New Door Frames: (PT-2 Finish)
  - 1st coat: Sherwin Williams Primer
  - (2) coats: Sherwin Williams 7067Cityscape, Semi-Gloss.
- 3. Interior Spot Priming: (at stains)
  - Apply coats as required, primer sealer stain killer.

NOTE: All surfaces shall be spot primed as necessary so as to prevent stains from "bleeding" through new paint finish.

4. Exterior Metal: (where applicable)

(2) coats: Sherwin Williams Sher-Cryl HPA, B66-300 Series  
(NOTE: Apply Kem Kromik Metal Primer at all rusted or peeling locations prior to the (2)-coat paint application). Color shall be selected by the Architect.

NOTE: If rust is showing on metal, first coat shall be a rust inhibitive primer after proper preparation has been made.

3.09 OTHER SURFACES:

A. Surfaces for which the type of paint has not been specified shall be painted as specified for surfaces having similar conditions of exposure.

3.10 PAINT FOR OWNER:

A. Each container shall be clearly marked as to the type of paint or stain, color name (and number), manufacturer's name, and where used. Said containers shall be clean of excessive paint and have airtight covers.

END OF SECTION

## SECTION 09971

### WATERPROOF WALL PANELS

#### PART 1 - GENERAL

##### 1.1 SCOPE

- A. Provide waterproof wall panels where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

##### 1.2 REFERENCE

- A. ASTM D570 – Test Method for Water Absorption of Plastics.
- B. ASTM D2240 – Test Method for Rubber Property – Durometer Hardness.
- C. ASTM E84 – Surface Burning Characteristics of Building Materials.

##### 1.3 QUALITY ASSURANCE

- A. Standards:
  - 1. Comply with USDA Criteria for incidental food contact and ASTM E84, Class C, for surface burning characteristics of flame spread less than 200 and smoke density less than 450.
  - 2. Comply with ASTM D570 and ASTM D2240.
- B. Use of adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for performance of the Work of this Section.

##### 1.4 DELIVERY, STORAGE AND HANDLING

- A. Comply with the recommendations and instructions of the Manufacturer.

#### PART 2 - PRODUCTSMANUFACTURER

- A. To establish a level of quality and performance characteristics desired the specified new fiber reinforced panels base is based upon Marlite, 202 Harger Street, Dover, OH. 44622. (tel) 330-343-6621 or approved equal. Alternate manufacturers may be considered, but are subject to compliance with the requirements specified herein, including but not limited to performance characteristics, colors and warranty.

## 2.2 WALL PANELS

- A. Marlite FRP (Fiber Reinforced Panels) Panels:

1. Size: 4' – 0" x 8' – 0".
2. Sheet Thickness: 3/32 (2.4mm) nominal.
3. Color: P100 White.
4. Finish Texture: Pebble Surface.

## 2.3 OTHER MATERIALS

- A. Trim: Matching Marlite® molding trim as supplied by panel manufacturer for outside/inside corners, vertical joints, openings, outside angles, end caps, and ceiling intersections.
- B. Fasteners: Manufacturer's standard rivets.
- C. Adhesive: Non-flammable adhesive as recommended by the manufacturer for substrate encountered.
- D. Sealant: As recommended by panel manufacturer.
- E. Provide other materials, not specifically described, but required for a complete and proper installation, as selected by the Contractor, subject to the approval of the Architect.

## PART 3 - EXECUTION

### 3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

### 3.2 INSTALLATION

- A. Installation of panels shall be in strict accordance with the manufacturer's recommendations.
- B. Promptly, upon completion of installation, clean all exposed surfaces with methods and materials recommended by the manufacturer of the panels.

END OF SECTION

**SECTION 10440**  
**INTERIOR SIGNAGE**

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide interior signage at all Rooms and in locations as shown on the drawings.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.
- C. Schedule: Submit a schedule of all interior signage for review and approval.

1.03 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Manufacturers: Andco Industries Corp., ASI Sign Systems, The Supersine Co., Vomar Products, or approved equal.
- B. Interior Wall Mount Room Signage:
  - 1. Type: Unframed.
  - 2. Material: PVC and Vinyl
  - 3. Panel Depth: 0.25 inch thickness
  - 4. Attachable Backplate panel depth: 0.125 inch
  - 5. Panel Appearance: To be determined based on manufacturer's standard, high contrast, semi-matte color chart
  - 6. Surface Texture: Matte Non-Glare
  - 7. Sign size: (Min.) 10 inches x (Min.) 8 inches
  - 8. Copy: Applied die-cut vinyl lettering.
  - 9. Lettering: To be determined from manufacturer's standard letter styles and color charts
  - 10. Braille: Provide Grade 2 Braille Dor Configuration, with rounded or domed shape, meeting local accessibility codes.
  - 11. Accessories: Provide required standoff wall supports (min. of one per corner). Finish to be selected by Owner/Architect from Manufacturers standard finishes. Basis of design is to be based on
    - a. Finish: satin nickel finish.
    - b. Diameter: 5/8 inch
    - c. Finish Depth: 1/8 inch
  - 12. Style/Design:
    - a. Shape: Rectangular with Square corners



Note: GC to coordinate an initial design consultation with the Owner and Architect. Shop drawings are to be submitted for review and approval following that meeting.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.
- B. Restore damaged finishes. Clean and protect work from damage.

END OF SECTION

**SECTION 10500**  
**WARDROBE LOCKERS**

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Work included: Provide wardrobe lockers where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work Specified Elsewhere:
  - 1. Documents affecting work of this Section, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.02 QUALITY ASSURANCE:

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.03 SUBMITTALS:

- A. Comply with pertinent provisions of Section 01300.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

- A. To establish a level of quality and performance characteristics the desired specified wardrobe lockers based upon Command Gear Locker SKU: RN5187W by Lyon Metal Products, 420 N. Main St, Montgomery, IL 60538 (tel) 800-323-0082 <https://www.lyonworkspace.com/> . Alternate manufacturers may be considered, but are subject to compliance with the requirements specified herein, including but not limited to performance, style, characteristics, colors and warranty. Manufacturer's trade names are listed to establish a level for compliance
- B. DeBorough Manufacturing Co.
- C. Interior Steel Equipment Co.
- D. List Industries, Inc.
- E. Medart, Inc.

2.01 WARDROBE LOCKERS

- A. Provide single-tier lockers, size as shown on the Drawings, including the following properties:
  - 1. Standard louvered side panels.
  - 2. Secure storage compartments: Two compartments with steel recessed handles with built-in padlock hasp.

3. 8-inch tall 1-inch thick HDPE base of homogeneous color and a matte finish texture. Base shall be set back 3 inches from locker front to provide toe clearance.
  4. (2) Heavy Duty Hooks.
  5. (2) Single prong hooks
  6. Coat Rod.
  7. Shelf
  8. Aluminum card label holder
- B. Use all metal construction and finish in colors selected by the Architect, from colors of the approved manufacturer.

2.03 OTHER MATERIALS:

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the A/E.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS:

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION:

- A. Install the work of this Section where shown on the Drawings and in strict accordance with the manufacturer's installation recommendations as approved by the Architect, anchoring firmly into position for long life under hard use.

END OF SECTION

## SECTION 10800

### TOILET ROOM ACCESSORIES

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. Provide Toilet Room accessories where indicated on the drawings where specified herein, and as needed for a complete and proper installation.
- B. Related Work:
  - 1. Documents affecting work of this Section, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

##### 1.02 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. Contractor shall field verify all conditions and dimensions before ordering all bathroom accessories.

##### 1.03 SUBMITTALS:

- A. Comply with pertinent portions of Section 01300.
- B. Shop Drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.
  - 1. Submit to Architect for review, within ten (10) days after Award of Contract.
- C. Product Data: Indicate product description, fabrication information and compliance with specified performance requirements.

##### 1.04 DELIVERY, STORAGE AND HANDLING:

- A. Comply with pertinent portions of Section 01600.
- B. Deliver no components to the project site until areas are ready for installation. Store indoors.
- C. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

#### PART 2 - PRODUCTS

##### 2.01 MANUFACTURERS:

- A. To establish a level of quality and performance characteristics the desired specified toilet room accessories is based upon Bobrick Washroom Equipment, Inc. in the sizes and configurations indicated on the drawings. Alternate manufacturers may be considered, but are subject to compliance with the requirements specified herein, including but not limited to

performance, style, characteristics, colors and warranty. Manufacturer's trade names are listed to establish a level for compliance.

## 2.02 TOILET ROOM ACCESSORIES

### A. Shower Curtain

1. Model No: B-204-1
2. Size: 1 3/8" (35mm) x 2 9/16" (65mm)
3. Finish: 18-gauge, 304 stainless steel, satin finish
4. Quantity: twelve (12)

### B. Shower Curtain

1. Model No: B-204-2
2. Size: 42" (1065mm) W x 72" (1830mm) H
3. Finish: Opaque matte white vinyl (0.008" thick) containing antibacterial and flame-retardant agents and HDPE grommets along top at 6" o.c., hemmed bottom and sides
4. Quantity: one (1)

### C. G.B. (satin finish concealed mounted grab bar)

1. Model No.: B-6806
2. Size: 1-1/2" diameter x 18", 36" and 42" long
3. Mount: 35" from floor to center of horizontal, or as shown on the drawings
4. Finish: Satin with peened gripping surface

### D. T.P.H. (toilet paper holder)

1. Model: B-288
2. Size: 6" W, 11" H, 6" D
3. Finish: Bright polished stainless steel

### E. S.N.D. (Feminine sanitary napkin disposal with utility shelf):

1. Model No. B-271
2. Size: 8" shelf
3. Mount: 6" above top of water basin or flush valve (center on water closet).
4. Finish: 22 gauge stainless steel with satin finish.

### F. S.D. (surface-mounted soap dispensers):

1. Model No. B-4112 (all purpose valve)
2. Size: 7" long, 6" high, 3-1/2" deep
3. Mount: See drawings
4. Finish: Satin

### G. T.M. (tilting glass mirror):

1. Model No. 2-294
2. Size: 16" wide x 30" high
3. Mount: See drawings
4. Finish: Satin, No. 1 quality 1/4" float/plate glass mirror electrolytically copper plated

H. P.T.D. (semi-recessed paper towel dispenser):

1. Model No. B-3942
2. Size: 6-1/2" high x 3-1/16" deep x 1" wide.
3. Mount: See drawings
4. Finish: type 304 stainless steel, satin finish.

I. Coat Hook

1. Model No. B-682
2. Size: 56-1/4" high x 48-3/16" deep x 17-7/16" wide.
3. Mount: See drawings
4. Finish: type 304 stainless steel, satin finish.

J. Concealed Anchors:

1. Model: 257 Series anchor
2. For plaster wall
3. Consult Architect for use location

2.03 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor as subject to the approval of the Architect.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. Coordinate as required with other trades to assure proper and adequate provision for the work of those trades which interface with the work of this Section.
- B. Install each item in its proper location, firmly anchored into position, level and plumb, and in accordance with the manufacturer's recommendations.

END OF SECTION

## SECTION 11000

### EQUIPMENT

#### PART 1 GENERAL

##### 1.01 DESCRIPTION:

- A. Provide the equipment/systems/fixtures indicated on the drawings, herein and as required for a complete and proper job.
- B. Related Work Specified Elsewhere:
  - 1. Documents affecting work of this Section, but are not necessarily limited to, General Conditions, Supplementary Conditions, Mechanical and Electrical and related other Sections of these Specifications.

##### 1.02 QUALITY ASSURANCE:

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

##### 1.03 SUBMITTALS:

- A. Comply with pertinent provisions of Section 01300.
- B. Shop Drawings:
  - 1. Include location, type, dimensions, arrangement, equipment and materials.
  - 2. Indicate joints, backing anchor, mounting details, trim and accessories.
  - 3. Show cutouts for penetrations such as clocks, lights, and outlets.
- C. Manufacturer's Literature:
  - 1. Printed technical specifications, catalog data, and details of products.
  - 2. Recommended installation and maintenance instructions.
- D. Certificates: Manufacturer's certificates that materials comply with specification requirements.

##### 1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING:

- A. Comply with pertinent provisions of Division 1 specifications.

1.05 GUARANTEE:

- A. Manufacturer's warranty – Provide standard manufacturer's warranty (1)-year minimum. Warranty is to start at Substantial Completion.

PART 2 PRODUCTS

3.01 Kitchenette Appliances:

A. Range Hood ( with grease trap)

1. Basis-of-Design: To establish a level of quality and performance characteristics the desired specified range hood is based upon Hood Products, LLC (tel) 877-394-9731 [www.hoodfilters.com](http://www.hoodfilters.com). Alternate manufacturers may be considered, but are subject to compliance with the requirements specified herein, including but not limited to performance, style, characteristics, colors and warranty. Manufacturer's trade names are listed to establish a level for compliance.
  - a. Model No: 4824 HP-EX-2-PSP-F
  - b. Finish: Stainless Steel
  - c. Fit Width: 48 inches
  - d. Fit Height: 30 inches
  - e. Depth: 24 inches
  - f. Type: 1
  - g. Baffles: Stainless baffle with Handles, quantity of two (2)
  - h. Lights: L55 Series E26
  - i. Utility Cabinet Type: Ansul R-102
  - j. Wall Mounted
  - k. Supply Plenum: Front
  - l. Features: Grease drain with removal cup

B. Electric Range

1. Basis-of-Design: To establish a level of quality and performance characteristics the desired specified electric range is based upon Imperial Commercial Cooking Equipment, 1128 Sherborn Street, Corona, CA 92879-2089 USA (tel) 800.343.7790 <http://www.imperialrange.com/index.php>. Alternate manufacturers may be considered, but are subject to compliance with the requirements specified herein, including but not limited to performance, style, characteristics, colors and warranty. Manufacturer's trade names are listed to establish a level for compliance.
  - m. Style: Wall Canopy Hood with front perforated supply plenum
  - n. Finish: Stainless Steel
  - o. Fit Width: 36 inches
  - p. Fit Height: 56-1/2 inches
  - q. Depth: 31-1/4 inches
  - r. Number of Plates: 6
  - s. Oven: Standard

C. Dishwasher:

1. Basis-of-Design: To establish a level of quality and performance characteristics the desired specified dishwasher is based upon GE Profile Model Number PDT715SYNFS by GE Appliances, a Haier company . Alternate manufacturers may be considered, but are subject to compliance with the requirements specified herein, including but not limited to performance, style, characteristics, colors and warranty. Manufacturer's trade names are listed to establish a level for compliance.
  - a. Style: GE Profile
  - b. Finish: Stainless Steel
  - c. Fit Width: 23-3/4 inches



- d. Fit Height: 34 inches
- e. Depth: 24 inches
- f. Features: fingerprint resistant, sanitize cycle, dry boost with fan assist, top control panel
- g. Decibel Level: 45dBA

### 3.02 Shower

#### A. Transfer Shower Compartment

1. Basis-of-Design: To establish a level of quality and performance characteristics the desired specified transfer shower compartment is based upon Oasis Lifestyle, LLC 1400 Pidco Drive PO Box 82, Plymouth, IN 46563 (tel) 574.948.0004 <http://oasisbath.com/>. Alternate manufacturers may be considered, but are subject to compliance with the requirements specified herein, including but not limited to performance, style, characteristics, colors and warranty. Manufacturer's trade names are listed to establish SHFW – 3837/ANS17-RS
  - a. Finish: FRP gelcoat
  - b. Fit Width: 88 inches
  - c. Fit Height: 76-3/4 inches
  - d. Depth: 38-1/4 inches
  - e. Type: Transfer shower compartment
  - f. Features: 2-grab bar package (1-vertical grab bar), phenolic folding seat, shower rod

## PART 3 EXECUTION

### 3.01 INSPECTION

- A. Prior to installation, inspect supporting construction and grounds to assure surfaces/construction is appropriate for installation of systems/equipment/fixtures.
- B. Check surface conditions to assure that they are:
  1. Free from dust, dirt, or scaling paint;
  2. Free from projections or depressions that affect the installation or performance.
  3. Coordinate all work to allow for proper anchorage to slabs/wall surfaces (including but not limited to the location of radiant heating tubing)
- C. Do not proceed with installation until deficiencies are corrected.

### 3.02 INSTALLATION:

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.
- B. Install appropriate anchor clips and brackets at without affecting the adjacent structure/surfaces.
- C. Install the work of this Section in strict accordance with the original design, the approved Shop Drawings, pertinent requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures, anchoring all components firmly into position for long life under hard use.

- D. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.
- E. Restore damaged finishes. Clean and protect work from damage.
- F. Protect all installed components from damage.

END OF SECTION

## SECTION 11400

### FOOD SERVICE EQUIPMENT

#### PART 1 – GENERAL

##### 1.01 SUMMARY

- A. Provisions of Division 01 apply to this section.
- B. Section Includes:
  - 1. Stainless steel fabrications for food service use including: sinks, countertops, and cabinetry.
- C. Related Sections:
  - 1. Section 05500 Metal Fabrications: General requirements for metal fabrications, including metal supports.
  - 2. Section 07920 – Sealants and Caulking: Joint sealing for weather tightness, waterproofing and acoustical seals.
  - 3. Division 22 – Plumbing: Requirements for plumbing connections associated with food service equipment.
  - 4. Division 23 – Heating, Ventilating and Air Conditioning: Requirements for heating, ventilating and air conditioning (HVAC) Work associated with food service equipment.

##### 1.02 ABBREVIATIONS

- A. Refer to Kitchen drawings for additional abbreviations.

AFF	Above Finished Floor
AGA	American Gas Association
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing Materials
BTU	British Thermal Unit
C	Centigrade Celsius
CFC	Chlorofluorocarbon
db	Decibel
DSA	Division of State Architect
F	Fahrenheit
FDA	Food and Drug Administration
GA	Gauge
HP	Horsepower
ID	Inside Diameter
KW	Kilowatts
LCD	Liquid Crystal Display
Min.	Minimum
NA	Not Applicable, or Not Available
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NIC	Not in Contract
NSF	National Sanitation Foundation
OC	On Center
OD	Outer Dimension

OSHA	Occupational Safety & Health Administration
PSI	Pounds Per Square Inch
PVC	Polyvinylchloride
RPM	Revolutions per Minute
SMACNA	Sheet Metal & Air Conditioning Installers National Association
UL	Underwriters' Laboratories, Inc.
USDA	United States Department of Agriculture
V	Volts
W	Watts
°	Degree (Angle or Temperature)

1.03

SYSTEM DESCRIPTION

A. Design Requirements:

1. Provide adequate air supply and exhaust for all self-contained refrigeration condensing units
2. Install all food service equipment, complete and in strict accordance with Construction Documents.
3. All such equipment shall be of a nature and so installed as to be readily cleanable or made easily removable for cleaning.
4. Furnish all accessories and parts necessary to complete installation.
5. Coordinate work of this Section with delivery and installation.
6. Furnish all embedded restraining devices, and fittings as required to secure equipment and fixtures, whether new or reinstalled.
7. All work shall be designed and fabricated to suit field conditions and fitted with proper joints and intersections.

B. Regulatory Requirements:

1. Whichever drawings, specifications or regulations require larger sizes or higher standards more stringent shall govern.
2. All work and materials shall be in accordance with current editions of the following:
  - a. U.S. Public Health Service.
  - b. National Fire Protection Association.
  - c. Current National Sanitation Foundation standards.
    - 1) All custom-fabricated items and equipment shall conform to current standards and revisions established by National Sanitation Foundation.
  - d. Equipment must comply with applicable safety and sanitary standards of any recognized testing agency certified by American National Standards Institute (ANSI)
  - e. Local or state ordinances regarding the use of steam.
  - f. Rhode Island Department of Health Services.
  - g. State Accident Commission's Safety Orders.
  - h. O.S.H.A.
  - i. Current Edition of IBC.
  - j. Rhode Island State Fire Code.

- k. Environmental Protection Agency regulations.
  - l. State and local guidelines and regulations for seismic restraint of food service equipment and fixtures.
  - m. National Sanitation Foundation.
  - n. National Electrical Manufacturers Association.
  - o. Underwriters' Laboratories, Inc. Ice maker shall be U.L. approved
- C. Fees: Installer shall obtain and pay for the following:
- 1. All required permits and certificates of acceptance or of completion.
  - 2. Inspection certificates and licenses required and necessary for performance of Work
    - a. Post all notices as required by code.

1.04 SUBMITTALS

- A. Requests for substitutions must be made in accordance with Division 01 of Project Manual. **Contractor will be required to submit a “one-for-one” comparison of specified items and proposed items in ‘line-item’ form for approval; otherwise, such item(s) will be returned to Contractor as “Not Approved”, and consequently the specified item shall be provided by the Contractor.**
- B. Provide mounting templates for equipment and fixtures requiring fasteners set into masonry or concrete.
- C. Shop drawings: Prepare and submit shop drawings for all custom-fabricated equipment or fixtures and refrigeration systems. Include the following information:
  - 1. Include large-scale details of custom-fabricated equipment,
  - 2. Sizes and locations of mechanical and electrical services.
  - 3. Curbs or other bases for all custom-fabricated items.
  - 4. Indicate sizes and location of anchor sleeves and other items required to be built into work.
  - 5. Include sizes and locations of mechanical and electrical services for all Owner-furnished equipment to be relocated under this contract.
  - 6. Deviations from Construction Documents will only be allowed if approved in writing.
  - 7. Furnish five (3) sets of submittal drawings.
- E. Product Data: Furnish five (3) sets of submitted equipment bound in binder and indexed. Each fixture shall be identified with an item number, accessories and finishes.

1.05 QUALITY ASSURANCE

- A. Any inconsistencies between drawings and notes or code shall be resolved before commencing work
- B. Field verify conditions at site before proceeding with work.
- C. Follow manufacturer's directions where installation is not indicated on drawings or specifications.
- D. Dimensions indicated on drawings have been secured from best available information. Field verify all dimensions.

- E. Allow space for fittings.
  - F. Installer shall make final connections.
- 1.06 EQUIPMENT LIST APPROVAL
- A. In order to establish a standard of quality, equipment listed are specified from the indicated manufacturer.
  - B. When drawings are submitted for installation, their approval shall not waive requirements indicated in construction documents.
- 1.07 OPERATING INSTRUCTIONS AND MANUALS
- A. Furnish three (3) copies of bound "Operating Instructions and Service Manual" to Architect upon Substantial Completion of work. Incorporate complete information, including but not limited to following:
    - 1. Part numbers of all replaceable items.
    - 2. Manufacturer's cuts.
    - 3. Serial numbers of all principal pieces of equipment.
    - 4. Installing and service representatives companies, names, addresses, and phone, e-mail and FAX numbers.
- 1.08 PRODUCT HANDLING
- A. Deliver equipment to project site in new condition, free from defects or damage. Rejected items shall be removed from project and replaced without additional cost to Owner.
  - B. If equipment is too large to be moved through permanent openings in building, Installer shall make arrangements to have suitable temporary openings provided at his expense, or he shall furnish his equipment in sub-assemblies which may be moved through permanent openings and then assembled.
  - C. Installer shall make provisions (and pay storage fees) for items delivered to job site before and during installation. If receipt and storage cannot be arranged, all items must be received and accounted for by Installer.
- 1.09 SERVICE
- A. Food service equipment and fixtures shall be supported by a service organization that is, in opinion of Owner, reasonably convenient to site.
  - B. Installer to verify that manufacturer, or his agent, maintains an adequate stock of repair parts which shall be available for immediate, local delivery.
- 1.10 WARRANTY:
- A. Unless otherwise specified under item number, Warranty shall be Manufacturer's standard.

## PART 2 – PRODUCTS

### 2.01 STAINLESS STEEL CASEWORK

- A. All stainless steel shall be U.S. standard type 304, 16-gauge unless noted otherwise.
- B. Work table tops shall be sound deadened and mechanically polished to a satin finish.
- C. Stainless steel tops shall be 16-gauge, unless otherwise specified.
- D. Shelves under counter tops and shelves enclosed in base cabinets shall be 16-gauge stainless steel.
- E. Wall mounted Shelves over counter tops shall be 16-gauge stainless steel.
- F. All TIG welds. Exposed welds areas polished to match adjacent surfaces.
- G. Work table edges to have 1-5/8 inch sanitary rolled rim edge on front and square side edges and a 5-inch backsplash with a 1-inch return.
- H. Aluminum die cast “leg-to-shelf” clamp secures shelf to leg eliminating unsightly nuts and bolts. Undershelf is adjustable.
- I. Roll formed embossed galvanized hat channels are secured to top by means of structural adhesive and weld studs
- J. Gussets welded to support hat section

### 2.02 MANUFACTURERS

- A. To establish a level of quality and performance characteristics the desired specified work tables, cabinets, shelving and sink is based upon Advanced Tabco, Hauppauge, NY 11788 (tel) 1-800-645-3166 <https://advancetabco.com/index.asp?title=Advance%20Tabco> . Alternate manufacturers may be considered, but are subject to compliance with the requirements specified herein, including but not limited to performance, style, characteristics, colors and warranty. Manufacturer’s trade names are listed to establish a level for compliance.
- B. The following items, designated by item numbers, comprise a list from which equipment shall be furnished as specified and required to complete Work. These item numbers correspond with the Kitchen/Dining Equipment Schedule shown on the Drawings.
- C. **Prior to ordering equipment, coordinate all service requirements with Mechanical, Plumbing and Electrical drawings.**
  - 1. Work Table with Integral Sink:
    - a. Work Table Model: KMS-11B-305R
    - b. Length: 60-inches
    - c. Width: 30-inches
    - d. Sink Model: TA-11A-2
    - e. Sink Location: Right
    - f. Sink: Double

- g. Shelf: 18 gauge stainless steel type 430 series
2. Work Table:
    - a. Work Table Model: KMS-300
    - b. Length: 30-inches
    - c. Width: 30-inches
  3. Corner Work Table:
    - a. Work Table Model: KTMS-305
    - b. Length: 60-inches
    - c. Width: 30-inches
    - d. Stainless Steel leg Stretcher
  4. Enclosed Base Work Table:
    - a. Enclosed Base Work Table Model: HB-SS-244
    - b. Length: 48-inches
    - c. Width: 24-inches
  5. Enclosed Base Work Table:
    - a. Enclosed Base Work Table Model: HB-SS-245
    - b. Length: 60-inches
    - c. Width: 24-inches
  6. Wall Cabinets:
    - a. Wall Cabinet Model: WCS-15-48
    - b. Length: 60-inches
    - c. Width: 15-inches
    - d. Doors: two (2) sliding
    - e. Top: Sloped
  7. Wall Mounted Shelving
    - a. Wall Mounted Shelving Model: WS-10-60
    - b. Length: 60-inches
    - c. Width: 10-inches
    - d. Edge Profile: 1-5/8 inch bullnose front, 1-1/2 inch rear up-turn
    - e. Finish: Satin Finish Stainless Steel



8. Wall Mounted Shelving
  - a. Wall Mounted Shelving Model: WS-10-48
  - b. Length: 648-inches
  - c. Width: 10-inches
  - d. Edge Profile: 1-5/8 inch bullnose front, 1-1/2 inch rear up-turn
  - e. Finish: Satin Finish Stainless Steel

### PART 3 – INSTALLATION

#### 3.01 GENERAL

- A. Food service equipment shall be installed strictly in accordance with approved shop drawings and manufacturers' instructions.
- C. Install equipment level, and securely fasten fixed equipment in place.

#### 3.02 FINAL CLEANING:

- A. Clean, sanitize and have ready for operation all food service equipment and fixtures at time of Environmental Health inspections and at time of turn over of facility to Owner.

#### 3.03 CLEAN-UP

- A. Remove all debris and rubbish from premises and legally disposed of.
- B. Equipment shall be clean and ready for use when turned over to Owner.
  1. Protection of completed and cleaned work shall be responsibility of Kitchen Equipment Supplier.

END OF SECTION

**SECTION 12241**  
**WINDOW ROLLER SHADES**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Roller shades for manual operation and accessories.
- B. Shade fabric.

**1.2 RELATED SECTIONS**

- A. Section 06100 - Rough Carpentry: Wood blocking and grounds for mounting roller shades and accessories.
- B. Section 09290 - Gypsum Board: Coordination with gypsum board assemblies for installation of shade pockets, closures and related accessories.
- C. Section 09513 - Acoustical Ceilings: Coordination with acoustical ceiling systems for installation of shade pockets, closures and related accessories.

**1.3 REFERENCES**

- A. ASTM International (ASTM):
  - 1. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- B. Cradle to Cradle Products Innovation Institute (C2C):
  - 1. C2C (DIR) - C2C Certified Products Registry.
- C. National Fire Protection Association (NFPA):
  - 1. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
  - 2. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.
- D. Underwriters Laboratories (UL):
  - 1. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.
- E. Window Covering Manufacturers Association (WCMA):
  - 1. WCMA A100.1 - Safety of Window Covering Products; 2018.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to provide rough-in of electrical wiring as required for installation of hardwired motorized shades.
- B. Preinstallation Meeting: One week prior to commencing work related to this section. Require attendance of all affected installers.

- C. Sequencing:
  - 1. Do not fabricate shades until field dimensions for each opening have been verified with finished conditions in place. "Hold to" dimensions are not acceptable.
  - 2. Do not install shades until final surface finishes and painting are complete.

## 1.5 SUBMITTALS

- A. Refer to Section 01330 – Submittal Procedures, for submittal procedures.
- B. Product Data: Manufacturer's catalog pages and data sheets for products specified including materials, finishes, dimensions, profiles, mountings, and accessories.
  - 1. Preparation instructions and recommendations.
  - 2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes, accessories, and operating instructions.
  - 3. Storage and handling requirements and recommendations.
  - 4. Mounting details and installation methods.
  - 5. Manufacturer's Instructions: Include storage, handling, protection, examination, preparation, and installation.
  - 6. Project Record Documents: Record actual locations of control system components and show interconnecting wiring.
  - 7. Operation and Maintenance Data: Component list with part numbers, and operation and maintenance instructions.
- C. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to adjacent work.
  - 1. Prepare shop drawings on AutoCad or Revit format using base sheets provided electronically by the Architect.
- D. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.
- E. Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements.
  - 1. Shadecloth Sample: Mark face of material to indicate interior faces.
    - a. Test reports indicating compliance with specified fabric properties.
    - b. Verification Samples: 6 inches (150 mm) square, representing actual materials, color and pattern.
- F. Maintenance Data: Bill of materials for all components with part numbers. Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.
- G. Warranty: Provide manufacturer's warranty documents as specified in this Section.

## 1.6 QUALITY ASSURANCE

- A. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
- B. Manufacturer Qualifications: Obtain roller shades system through one source from a single manufacturer with a minimum of ten years experience and minimum of five projects of

similar scope and size in manufacturing products comparable to those specified in this section.

- C. Installer for Roller Shade System - Qualifications: Installer trained and certified by the manufacturer with a minimum of five years experience in installing products comparable to those specified in this section.
- D. Product Listing Organization Qualifications: Organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
- E. Fire-Test-Response Characteristics: Passes NFPA 701 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.
- F. Shadecloth Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC9644, ATCC9645.
- G. Third Party Evaluation: Provide documentation stating the shade cloth has undergone third party evaluation for all chemical inputs, down to a scale of 100 parts per million, that have been evaluated for human and environmental safety. Identify any and all inputs, which are known to be carcinogenic, mutagenic, teratogenic, reproductively toxic, or endocrine disrupting. Also identify items that are toxic to aquatic systems, contain heavy metals, or organohalogens. The material shall contain no inputs that are known problems to human or environmental health per the above major criteria, except for an input that is required to meet local fire codes.

#### 1.7 MOCK-UP

- A. Provide a mock-up of one roller shade assembly for evaluation of mounting, appearance and accessories.
  - 1. Locate mock-up in window designated by Architect.
  - 2. Mockup Size: Full size.
  - 3. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
  - 4. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
  - 5. Do not proceed with remaining work until, mock-up is accepted by Architect.
  - 6. Retain mock-up during construction as a standard for comparison with completed work.
  - 7. Do not alter or remove mock-up until work is completed or removal is authorized.
  - 8. Full-sized mock-up may become part of the final installation.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in Window Treatment Schedule.
- B. Store and handle products per manufacturer's recommendations.

#### 1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

## 1.10 WARRANTY

- A. Roller Shade Hardware and Chain Warranty: Manufacturer's standard non-depreciating warranty for interior shading.
  - 1. Shade Hardware: 10 years unless otherwise indicated.
  - 2. Standard Shadecloth: Manufacturer's standard twenty-five year warranty.
  - 3. Roller Shade Installation: One (1) year from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas, which are deemed owner's responsibility.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design: To establish a level of quality and performance characteristics the desired specified window roller shade is based upon Mecho, 42-03 35th St.; Long Island City, NY 11101; ASD Tel: 718-729-2020; Fax: 718-729-2941; Email: marketing@mechoshade.com; Web: www.mechoshade.com. Alternate manufacturers may be considered, but are subject to compliance with the requirements specified herein, including but not limited to performance, style, characteristics, colors and warranty. Manufacturer's trade names are listed to establish a level for compliance.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01600 – Product Requirements

### 2.2 ROLLER SHADES, MANUAL OPERATION AND ACCESSORIES

- A. Shade System; General:
  - 1. Components capable of being removed or adjusted without removing mounted shade brackets, or cassette support channel.
  - 2. Smooth operation raising or lowering shades.
  - 3. Cradle-to-Cradle certified for the complete shade system including operating hardware and shadecloth. Listed in C2C (DIR).
- B. Basis of Design: Mecho/5 System as manufactured by Mecho.
  - 1. Description: Manually operated fabric window shades.
    - a. Shade Type: Single Roller.
    - b. Universal drive capability to offset drive chain for reverse or regular roll shades.
    - c. Drop Position: Regular roll.
    - d. Mounting: Recessed in window pocket.
    - e. Size: Sizes vary – General Contractor and Vendor to verify lengths prior to ordering.
    - f. Fabric: As indicated under Shade Fabric article.
  - 2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
    - a. Material: Steel, 1/8 inch (3 mm) thick.
  - 3. Roller Tubes:
    - a. Material: Extruded aluminum.

- b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
  - c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge. Shade band to be removable and replaceable without removing roller tube from brackets or inserting spline from the side of the roller tube.
  - d. Roller tubes to be capable of being removed and reinstalled without affecting roller shade limit adjustments.
4. Hembars: Designed to maintain bottom of shade straight and flat.
- a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
5. Clutch Operator: Manufacturer's standard material and design integrated with bracket/brake assembly.
- a. Heavy-duty, 1/8" steel mounting bracket and integrated steel brake, clutch and sprocket assembly rigidly affix the shade support and user control to the building structure fully independent of the roller tube components.
  - b. Permanently lubricated maintenance-free brake assembly employs an oil-impregnated steel hub with wrapped spring clutch.
  - c. Brake must withstand minimum pull force of 50 pounds (22.7 kg) in the stopped position.
  - d. Direct drive clutch requires no interstitial gear stages or plastic parts between the building structure and clutch ensuring reliable operation across the full range of shade sizes.
  - e. Maximum shade hanging weight of 18 pounds (8.2 kg).
6. Drive Chain: Continuous loop stainless steel beaded ball chain, 100 pound (45 kg) minimum breaking strength. Provide upper and lower limit stops.
- a. Chain Retainer: Chain tensioning device complying with WCMA A100.1.
  - b. Limit stops: Bead stops affixed to the chain maintain consistent shadeband alignment at the top and bottom of shade travel across multiple shades, and help prevent shade damage resulting from unmanaged user control.
7. Accessories:
- a. Fascia: Removable extruded aluminum fascia, size as required to conceal shade mounting, attachable to brackets without exposed fasteners.
    - 1) Finish: Clear anodized.
    - 2) Finish: Fabric wrapped to match shade.
    - 3) Can be installed across two or more shade bands in one piece.
    - 4) Single Fascia: Accommodate regular roll shades.
    - 5) Profile: Square.
    - 6) Configuration: Continuous, fascia extends past continuous bracket.
  - b. Ceiling Pockets: Premanufactured metal shade pocket for recess mounting in drywall ceilings.

## 2.3 ROLLER SHADE FABRICATION

- A. Field measure finished openings prior to ordering or fabrication.
- B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
  - 1. Vertical Dimensions: Fill Opening from Head to Sill: 1/2 inch (13 mm) space between bottom bar and window stool.
  - 2. Horizontal Dimensions: Inside Mounting.
    - a. Fill openings from jamb to jamb. No light gap.

## 2.4 SHADE FABRIC

- A. Basis of Design: Shade fabric as manufactured by Mecho.
  - 1. Solar Shade cloths:
    - a. Fabric: ThermoVeil Basket Weave: 1500 series. 3 percent open 2 by 2 dense basket-weave pattern, colors match 1300 (5 percent open), also 126 inches (3200 mm) wide.
  - 2. Fabric Properties: Non-flammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
    - a. Shade Type: Light filtering shades.
    - b. Material Composition: PVC coated polyester yarns.
  - 3. Material Certificates and Product Disclosures:
    - a. Health Product Declaration (HPD): Published declaration with full disclosure of known hazards.
    - b. Declare label.
  - 4. Performance Requirements:
    - a. Flammability per NFPA 701: Pass. Large or small scale test.
    - b. Fungal Resistance: No growth when tested per ASTM G21.
    - c. Visible Light Transmittance: 8 percent nominal.
  - 5. Openness Factor: 3 percent, nominal.
  - 6. Roll Width: Refer to Section 2.2 item B of these specifications.
  - 7. Color: 1519 Silver Birch
  - 8. Fabrication:
    - a. Fabric Orientation: Railroaded, fabric is turned 90 degrees off the roll.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Start of installation shall be considered acceptance of substrates.

### 3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.
- C. Coordinate with window installation and placement of concealed blocking to support shades.

### 3.3 INSTALLATION

- A. Install shades level, plumb, square, and true per manufacturer's instructions and approved shop drawings. Locate so shade band is at least 2 inches (51 mm) from interior face of glass. Allow proper clearances for window operation hardware. Use mounting devices as indicated.
- B. Replace shades exceeding specified tolerances at no extra cost to Owner.

- C. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric.
- D. Clean roller shade surfaces after installation, per manufacturer's written instructions.
- E. Demonstrate operation and maintenance of window shade system to Owner's personnel.
- F. Manufacturer's authorized personnel are to train Owner's personnel on operation and maintenance of system.
  - 1. Use operation and maintenance manual as a reference, supplemented with additional training materials as required.

#### 3.4 PROTECTION AND CLEANING

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
  - 1. Clean soiled shades and exposed components as recommended by manufacturer.
  - 2. Replace shades that cannot be cleaned to "like new" condition.

END OF SECTION



## SECTION 22 00 00

### Plumbing Systems

#### PART 1 - GENERAL

##### 1.1 PRE-INSTALLATION CONFERENCE

- A. Meetings for the project shall be held at least a minimum of one week in advance of the time scheduled for work. The meeting shall be used to review requirements of the work and conditions which could possibly interfere with successful performance of the work. Attendance is required by all parties concerned with the work, or required to coordinate with or to protect the work thereafter, including:
1. Owner or Representative
  2. General Contractor
  3. Installer
  4. Engineer

##### 1.2 RELATED DOCUMENTS

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

##### 1.3 SUMMARY

A. SECTION INCLUDES

1. All sanitary waste and vent piping
2. All cold and hot water piping
3. All hot water return piping
4. Floor drains
5. Final connections to all equipment
6. Natural Gas piping
7. Connections to all gas fired equipment
8. Trap Guards
9. Plumbing fixtures
10. Insulation
11. Drain System
12. Coordinate all work with phasing plans and requirements.
13. Temporary connections during construction.
14. Coordinate all electrical requirements with electrical contractor
15. Provide each system complete and ready for use.
16. Inspect, test and approve all piping before burying, covering or concealing. No exceptions will be made.
17. Sterilization of new water lines.
18. Other items in the work covered in other sections of the specifications, as shown and specified herein.
19. Final connections to plumbing fixtures as specified herein and all equipment requiring such connection

- B. Provide all manufactured items and equipment in accordance with manufacturer's

recommendations. Provide all necessary specialties and accessories, including anchors and supports.

- C. Examine all sections of specification and drawings for requirements affecting the work of this section, as shown and specified herein.
- D. Include in the bid price all utility company and municipal back charges for all materials furnished and work performed by them in conjunction with this contract.

#### 1.4 DEFINITIONS

- A. The term "capped flush" on existing piping means cap existing lines, concealed, beyond finish wall, ceiling or floor line, so proper finish can be applied.
- B. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, and unheated spaces immediately below roof, spaces above ceiling, unexcavated spaces, crawl spaces, and tunnels.
- C. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms
- D. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- E. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
- F. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- G. The following are industry abbreviations for rubber materials:
  - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
  - 2. NBR: Acrylonitrile-butadiene rubber.
- H. "Furnish and install" and "Provide" means to supply, erect, install and connect in readiness for regular operation, the particular work referred to, unless otherwise specified.
- I. "Underground" shall mean pipe, conduit or equipment that is buried exterior to or within the building.
- J. "Finished grade" as used herein, means the final grade elevations indicated on the drawings.
- K. Piping shall mean and include pipe, fittings, hangers, and valves.
- L. Tempered water shall be considered the same as hot water throughout the specifications.

## 1.5 RELATED SECTIONS

- A. Cutting and patching - Division 1.
- B. Coring of holes and saw cutting in concrete - Division 1.
- C. Condensate piping - Division 23.
- D. Heating connections, thermostats - Division 23.
- E. Electrical connections - Division 26.

## 1.6 CODES, ORDINANCES AND PERMITS

- A. All work performed under this section of the specifications shall be done in accordance with the applicable National, State of Rhode Island Plumbing and Energy Codes and local codes, laws and ordinances.
- B. All materials and work provided shall be in accordance with, but not limited to, the following:
  - 1. American National Standards Institute (ANSI).
  - 2. American Society for Testing and Materials (ASTM)
  - 3. American Society of Mechanical Engineers (ASME)
  - 4. International Code Council (ICC)
  - 5. National and State Electrical Code (NEC)
  - 6. National Electrical Manufacturer's Association (NEMA)
  - 7. National Fire Protection Association Codes and Standards (NFPA)
  - 8. Occupational Safety and Health Act (OSHA)
  - 9. State Building and Handicapped Codes
  - 10. Standards of Underwriters Laboratories (UL)
  - 11. Providence Water Supply Board Rules and Regulations
- C. Where code references are given, the latest issue of that code in effect at the time of bidding shall be used. Code references given to indicate the minimum quality and performance acceptable. Where specifications and/or drawings indicate more stringent requirements, the specification shall govern.
- D. Permits and inspections: Be responsible for filing all documents, payment of all fees and securing of all permits and scheduling of all required inspections and approvals necessary for the installation and operation of all systems furnished under this section.

## 1.7 PROTECTION

- A. Protect materials, fixtures and fittings. Temporarily close all pipe openings to prevent obstruction and damage. Board over, water closets, lavatories and sinks and protect other fixtures with pasted-on paper.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

- C. Post notices prohibiting the use of the fixtures prior to completion.

#### 1.8 CUTTING AND FITTING

- A. Do the cutting and fitting necessary for the installation of the plumbing work and maintain fire integrity of floor to floor construction.
- B. Take care to prevent injury, discoloration or defacement of other finish materials; and do no cutting or fitting of finish material.

#### 1.9 CLEANING

- A. Upon completion of the installation, clean and remove all oil and debris. Clean and polish and leave bright all fixtures and metal work intended to be exposed. Clean out the piping systems and all fixtures, traps and cleanouts. Leave all work in perfect operating condition.
- B. Should any pipe, duct or any part of the apparatus be stopped by refuse after the apparatus has been accepted, pay for the disconnecting, cleaning and reconnection, wherever necessary, for the purpose of location and removing the obstruction. Pay for repairs to adjoining work required thereby.

#### 1.10 DRAWINGS

- A. The drawings are diagrammatic, and not intended to show every detail of construction or arbitrary location of piping. Where building construction makes it advisable or necessary to change location of piping or fixtures, without increasing the scope of work, perform such work without additional cost, on written order or consent of the Engineer.
- B. Install the work as shown. In case of conflict with building parts, or the work of other trades, immediately request a decision be rendered so that there may be no delay in the building construction.
- C. Submit for written approval, single line diagrams of any proposed changes or modification to the drawings, at least one week before prices are due.

#### 1.11 QUALITY ASSURANCE

- A. Submit catalog cuts and brochures for approval of all proposed materials to be used on the project.
- B. Materials and equipment under the section shall be new and of the best grade.
  - 1. Materials shall conform to the requirement of the State of Rhode Island Plumbing Code, local city requirements, and standards listed such as commercial USAS or ASTM and requirements specifically stipulated herein.
- C. All plumbing products used within the domestic water system are to meet or exceed NSF/ANSI 61 Standard requirements for lead-free products.
- D. Unless otherwise specified, apply and pay for all necessary permits, fees, and

inspections required by any public authority having jurisdiction.

- E. Pay all utility company back charges.
- F. If conflicts occur within these specifications or on the drawings or either between the items of greater quality or higher cost shall be bid and provided.
- G. Submit copies of manufacturer's recommendation on installing pipe for approval.
- H. In addition to other requirements specified herein, the Contractor shall furnish notarized test reports and methods of test by an approved independent testing laboratory to show compliance of all materials furnished under this section of the specifications with all specification requirements and pipe manufacturer's notarized certificates of conformance stating that all materials to be furnished under these items conform with all specification requirements. Each shipment of pipe and pipe fittings shall be accompanied with the pipe manufacturer's notarized certificate of conformance, certifying that the pipe and pipe fittings meet all requirements of the specifications. All testing of all materials furnished under this section of the specifications shall be provided by the Contractor at no additional expense to the Owner.
- I. Where items of equipment and/or materials are specified or materials are specified or identified herein by manufacturer's names, model or catalog numbers, only such specified items may be used.
- J. Submit, in booklet form, all plumbing fixtures and related accessories for any fixtures and/or equipment.
- K. Submit, in booklet form, all plumbing fixtures and related accessories for any fixtures and/or equipment different than the manufacturers listed. Submit catalog cuts of both manufacturers.
- L. Submit complete maintenance and operational charts and manuals for all equipment and fixtures specified, indicated or required for this work.
- M. On completion of the work, attach 1-1/2" diameter brass or embossed plastic as manufactured by Seton Nameplate Company consecutively numbered tags to all valves, also furnish two (2) typewritten charts (framed and glazed) showing all valve numbers with their location and riser controls. Identify all equipment with laminated plastic (lamicoid) nameplates fastened to the equipment as approved. These numbered valves to be shown on Record Drawings.
- N. Keep on file, at job site, a clean set of prints to clearly and accurately note all changes, wherever work is installed other than shown. After completion of work, provide a corrected set of drawings in PDF format on CD labeled "Record Drawings" and (2) sets of prints.
- O. Installer shall be qualified, licensed within the jurisdiction, and familiar with the installation of cold press mechanical joint systems. Mega-Press G, Stainless Steel and or Pro-Press fittings shall be installed using the proper tools, actuator, jaws and rings as instructed by the press fitting manufacturer.

1. Installation of stainless-steel pipe, Pro-Press and or MegaPress G is to conform to the requirements of the Plumbing Code and or Fuel Gas Code and manufacturer's installation requirements.
  2. Pipe shall be shipped to the job site by truck or in such a manner to protect the pipe. The pipe and fittings shall not be handled roughly during shipment. The pipe and fittings shall be unloaded with reasonable care.
  3. Protect the stored pipe from moisture and dirt. Elevate above grade. When stored inside, do not exceed the structural capacity of the floor.
  4. Protect fittings and piping specialties from moisture and dirt.
- P. The installation of black steel pipe in natural gas systems shall conform to the requirements of the State of Rhode Island Fuel Gas Code.

#### 1.12 ACCESSIBILITY

- A. Be responsible for sufficiency of shafts and chases, with adequate clearances for the proper installation of the work. Cooperate with all other contractors, whose work is in the same space, and advise the Contractor of all requirements. Keep such spaces and clearances to the minimum size required.
- B. Locate all equipment, which must be operated, serviced or maintained, in fully accessible locations. Equipment includes, but is not limited to: valves, traps, cleanouts and drain points. If required for better accessibility, provide access doors. Make minor deviations to allow for better accessibility, however, review such changes with the Architect/Engineer.

#### 1.13 COORDINATION

- A. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to allow for plumbing installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

#### 1.14 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- A. Refer to General Conditions (and Supplementary Conditions), Shop Drawings, Product Data and Samples and add the following:
  1. Within thirty (30) days after the date of notice to proceed and before purchasing any materials or equipment, submit to the Architect for review, a complete list, in six (6) copies, of all materials to be incorporated in the work. This listing shall be arranged by the order of occurrence in the specifications, followed by the items on the drawings not specifically included in the specifications.
  2. After the list has been processed by the Architect, submit complete shop drawings and product data of all equipment. These submittals shall be submitted within thirty (30) days after the processing date of the original submittal list.

3. All submittals shall be complete and shall be in three-ring loose-leaf binders. No consideration will be given to partial submittals, except with prior approval of the Architect. Each item shall have a cover page stating project, specification and paragraph reference number, of drawing reference number, and scheduled equipment identification number, if applicable.
  4. The review of submittals does not relieve this Contractor from the responsibility of shop drawing errors in details, sizes, quantities, wiring diagram arrangements and dimensions which deviate from the specifications, contract drawings, and/or job conditions as they exist.
  5. Changes to work already performed made necessary by delays in shop drawing review are the responsibility of this Contractor.
  6. Copies of equipment and system guarantees shall be submitted with shop drawing package.
- B. Refer to General Conditions (and Supplementary Conditions) for substitution of equipment.
  - C. If apparatus or materials are substituted for those specified under this section, and such substitutions necessitate changes in or additional connects, supports or construction, same shall be provided at no additional cost to the Owner. This Contractor shall assume cost and entire responsibility thereof. Architect's permission to make such substitution shall not relieve this Contractor from full responsibility for work.
  - D. If submitted product is different from the manufacturer specified provide in booklet form, all plumbing fixtures, etc. and related accessories and/or equipment different than the manufacturers listed. Submit catalog cuts of both manufacturers addressing point by point that the submitted product is equal to the specified models, etc.
  - E. Provide catalog cuts for both manufacturers' product if the product submitted is not the specified product. Submittal is to provide point by point comparison addressing each of the specified manufacturer's specific requirements vs the submitted manufacturer.

#### 1.15 RECORD DRAWING

- A. The General Contractor shall provide two (2) sets of black line on white record drawings to this Contractor, one set of which shall be maintained at the site and one set of which shall, at all times, be accurate, clear and complete, showing the actual location of all equipment and piping. The record drawings shall be available to the Architect's/Engineer's field representative at all times.
- B. Any addenda sketches, supplementary drawings and change orders issued during the course of construction shall be transferred to the record drawings.
- C. At the completion of this contract, this Contractor shall submit through the General Contractor an accurate checked set of record drawings.
- D. Non-availability of record drawings or inaccuracies therein shall postpone the final inspection until they are available.
- E. After approval of these record drawings, photo reproductions of the original tracings shall

be revised to incorporate all the changes on the record drawings. These photo reproductions shall be certified by this Contractor as correct and delivered to the Architect together with two (2) sets of black line prints.

- F. All costs related to the foregoing requirements shall be paid for this Contractor.
- G. All valves shown on these drawings shall be numbered with numbers corresponding to those on the valve charts.

#### 1.16 USE OF ELECTRONIC DRAWING FILES

- A. If requested, the Engineer will provide electronic copies of selected CAD (Computer Aided Design) drawing files for the Contractor's use in the preparation of shop drawings, coordination drawings, or as-built drawings related to this project, subject to the terms and conditions in the following paragraphs.
- B. The Engineer's electronic files are prepared on AutoCAD. The Engineer will provide drawing files through Release 2013.
- C. Data contained on these electronic files is part of the Engineer's instruments of service and shall not be used by the Contractor or anyone else receiving this data through or from the Contractor for any purpose other than as a convenience in the preparation of shop drawings, coordination drawings, or as-built drawings for the referenced project. Any other use or reuse by the Contractor or by others will be at the Contractor's sole risk and without liability or legal exposure to the Engineer. In accepting these files, the Contractor shall agree to make no claim and shall waive, to the fullest extent permitted by law, any claim or cause of action of any nature against the Engineer, its officers, directors, and employees, agents of the Engineer, which may arise out of or in connection with the Contractor's use of the electronic files.
- D. Furthermore, the Contractor shall to the fullest extent permitted by law, indemnify and hold harmless the Engineer from all claims, damages, losses and expenses, including attorney's fees arising out of or resulting from the Contractor's use of these electronic files.
- E. These electronic files are not contract documents. Significant differences may exist between these electronic files and corresponding hard copy contract documents due to software incompatibility, software translation, addenda, change orders or other revisions. The engineer makes no representation regarding the accuracy or completeness of these electronic files. In the event that a conflict arises between the hard copy contract documents prepared by the Engineer and the electronic files, the hard copy contract documents shall govern. The Contractor is responsible for determining if any conflict exists.
  - 1. By use of these electronic files, the Contractor is not relieved of his duty to fully comply with the contract documents, including and without limitation, the need to check, confirm and coordinate all work with that of other contractors for the project.
- F. Because of the potential that the information presented on the electronic files can be modified, unintentionally or otherwise, the Engineer reserves the right to remove all indication of their respective ownership and/or involvement from each electronic file



provided.

- G. A service fee of \$100.00 per sheet shall be remitted directly to the Engineer prior to delivery of the electronic files. Arrangements shall be made directly with the Engineer for files prepared by them. Electronic files will not be released until payment is received. A written release to be prepared by the Engineer will be required as well.
- H. Under no circumstances shall delivery of the electronic files for use by the Contractor be deemed a sale by the Engineer, who makes no warranties, either expressed or implied, of merchantability and fitness for any particular purpose. In no event shall the Engineer or its consultant (s) be liable for any loss of profit or any consequential damages arising out of the use of these electronic files.

#### 1.17 WARRANTY

- A. Refer to General Conditions and add the following:
  - 1. Standard equipment guarantees offered by the manufacturer for on (1) year or greater shall be in addition to that as required by this contract.
  - 2. Copy of manufacturer's equipment guarantees shall be submitted with this Contractor's written guarantee.
  - 3. All pipe and fittings manufacturer shall warrant that the pipe and fittings are free from defects and conform to the designated standard. The warranty shall only be applicable to pipe and fittings installed in accordance with the manufacturer's installation instructions.

### PART 2 - PRODUCTS

#### 2.1 WASTE AND VENT PIPING:

- A. Underground Piping: (unless otherwise indicated)
  - 1. Pipe and fittings shall be manufactured from PVC compound with a cell class of 12454 per ASTM D 1784 and conform with National Sanitation Foundation (NSF) standard 14. Pipe shall be iron pipe size (IPS) conforming to ASTM D 1785 and ASTM D 2665. Injection molded fittings shall conform to ASTM D 2665. Fabricated fittings shall conform to ASTM F 1866. All cast iron soil pipe and fittings are to be marked with the collective trademark of CISPI and to conform to the latest CISPI Standards 301, CISPI 310, ASTM A 888, ASTM C 564 or ASTM A 74 Standards and be listed by NSF International.
  - 2. All pipe and fittings to be produced by a single manufacturer and to be installed in accordance with manufacturer's recommendations and local code requirements. **WARNING!** Never test with or transport/store compressed air or gas in PVC pipe or fittings. Solvent cements shall conform to ASTM D 2564. Primer shall conform to ASTM F 656. The system to be manufactured by Charlotte Pipe and Foundry Co. and is intended for non-pressure drainage applications where the temperature will not exceed 140°F.
- B. Aboveground Piping: (unless otherwise indicated)
  - 1. Pipe and fittings shall be manufactured from PVC compound with a cell class of 12454 per ASTM D 1784 and conform with National Sanitation Foundation (NSF) standard 14. Pipe shall be iron pipe size (IPS) conforming to ASTM D 1785 and

ASTM D 2665. Injection molded fittings shall conform to ASTM D 2665. Fabricated fittings shall conform to ASTM F 1866. All cast iron soil pipe and fittings are to be marked with the collective trademark of CISPI and to conform to the latest CISPI Standards 301, CISPI 310, ASTM A 888, ASTM C 564 or ASTM A 74 Standards and be listed by NSF International.

2. All pipe and fittings to be produced by a single manufacturer and to be installed in accordance with manufacturer's recommendations and local code requirements. WARNING! Never test with or transport/store compressed air or gas in PVC pipe or fittings. Solvent cements shall conform to ASTM D 2564. Primer shall conform to ASTM F 656. The system to be manufactured by Charlotte Pipe and Foundry Co. and is intended for non-pressure drainage applications where the temperature will not exceed 140°F.
3. Provide chrome plating for all exposed piping to plumbing fixtures in toilet rooms, and finished rooms, etc., including chrome plated traps.
4. Chrome plate all exposed traps and water supplies, whether insulated or not, including piping covered with Trap-Wrap.

## 2.2 INDIRECT WASTE PIPING

- A. Pipe shall be manufactured from virgin rigid PVC (polyvinyl chloride) vinyl compounds with a cell class of 12454 as identified in ASTM D 1784. PVC Schedule 40 pipe shall be Iron Pipe Size (IPS) conforming to ASTM D 1785 and ASTM D 2665. Injection molded PVC DWV fittings shall conform to ASTM D 2665. Fabricated PVC DWV fittings shall conform to ASTM F 1866. All pipe and fittings shall be manufactured in the United States. All systems shall utilize a separate waste and vent system. Pipe and fittings shall conform to NSF International Standard 14.

## 2.3 CLEANOUTS

- A. Provide raised square head cleanout plugs, where possible.
- B. Provide floor cleanouts that are adjustable on-grade cleanout, nickel bronze. Cleanout shall allow adjustment before and AFTER the concrete pour. Scoriated cleanout cover shall meet applicable load requirements for intended use. Cleanout shall include a slotted, polypropylene or brass cleanout plug, situated in base adapter. Designed in accordance with ASME A112.36.2M-2002. Provide Products by one of the following:
  1. Sioux Chief
  2. Jay R. Smith
  3. Zurn

## 2.4 FLOOR DRAINS

- A. Floor drain shall allow adjustment before and AFTER the concrete pour. Strainer shall meet applicable load requirements for intended use. Designed in accordance with ASME A112.6.3-2001. Provide Products by one of the following:
  1. Sioux Chief
  2. Jay R. Smith
  3. Zurn

- B. Provide a barrier-type trap seal protection device for all floor drains. Device shall be Sioux Chief's Trap Guard, or equal.

## 2.5 VENT FLASHINGS

- A. Provide roof flashings for vent pipes, of 16 oz. lead coated copper. Diameter of cylinder must allow for slip in case of settling. Extend vent pipe and flashing above roof. Terminate vents 18" above roof.
- B. Roof flashings for vent pipes are to be provided by roofing contractor coordination installation with roofer. Flashing must allow for slip in case of settling. Extend vent pipe and flashing above roof. Terminate vents minimum 18" above roof and be a minimum of 10'-0" from fresh-air intakes.

## 2.6 TRAPS

- A. Provide standard N.Y. Reg. "P" traps.
- B. All fixtures with waste connections shall be properly trapped and vented in accordance with the requirements of the State Plumbing Code and Plumbing Inspector.

## 2.7 SLEEVES, INSERTS AND ESCUTCHEONS

- A. For all openings required in concrete floors, concrete walls and masonry walls; install sleeves of proper size, when the forms are erected and before concrete is poured or masonry is set. Provide wrought iron and steel pipe sleeves for all sleeves through floors or walls, sizes as approved, and packed as required. Extend sleeves one inch above floor for exposed piping passing through the floor.
- B. Provide pipe sleeves through foundation walls and footings in accordance with State Plumbing Code.
- C. Watertight Silicone Fire Stopping sealants are to be used at all floor penetrations.
- D. Provide catalog cuts, in a three-ring binder, of various systems, materials, etc. to be used.
- E. Fit all exposed uncovered pipes passing through walls, in cabinets, floors and ceilings with chromium plated spun or split type escutcheons with clamping device for holding in position.
- F. Typical for all piping.
- G. This contractor is to verify that all fire stopping is compatible with each piping system.
- H. Coordinate all sleeving requirements with fire stopping contractor.
- I. Coordinate with Fire Stopping contractor all sleeving material types and sleeve sizes to

conform to the appropriate U.L. fire-stopping details in accordance with U.L. requirements, wall assembly fire-rated requirements and in compliance with codes and standards. Sleeving is required for all piping through floors; walls install sleeves in accordance with manufacturer's printed instructions.

## 2.8 HANGERS AND ANCHORS

- A. Support all piping from the building structure by means of approved hangers and cast iron concrete inserts or lag bolts. Support piping to maintain required grading and pitching of lines, to prevent vibration and to secure piping in place, and arrange so as to provide for expansion and contraction. Provide approved anchors.
- B. Provide all waste and vent and water risers with friction clamp at each floor level and where required.
- C. Provide clevis ring type hangers for piping with adjustable device, and machine threaded hanger rods. Provide copperized hangers for bare copper piping where piping is in contact with hangers.
- D. Size of rods shall follow schedule in NFPA Bulletin No. 13.
  - 1. 1" through 4" - 3/8" rod
- E. Provide hangers with double nuts.
  - 1. Submit physical samples for approval.
- F. Provide insulation protection shields: galvanized 20 gauge by 10" long for all insulated piping where hanger is installed outside the insulation sized to suit pipe size and insulation thickness.
- G. Submit detail. Provide sway bracing and anchors on all waste systems including roof drainage piping 4" and over in accordance with the State Building Code requirements.
- H. Provide Hilti expansion case concrete fasteners for piping 3" and over where drilling of concrete is required. Submit expansion type fasteners.

## 2.9 ABOVEGROUND WATER PIPING

- A. Install all piping in accordance with manufacturer's published recommendations and requirements and governing water department.
- B. Provide fittings, bends, offsets, flanges, etc. of approved pattern. Make branch connections from hot water risers to fixtures with appropriate joints to receive expansion stresses.
- C. Provide pressure gauges (0-200#) Ashcroft® Gauge Type 1009, stainless steel case, liquid filled, 4-1/2" dial or approved equal with individual shut-off valves, with gauge savers. Provide Products by one of the following:
  - 1. Ashcroft

2. Watts
  3. Grainger
- D. Provide ASTM B 88, Type L for all domestic water piping; cold, hot and hot water returns.
1. No bent tubing will be accepted.
  2. Coordinate with drawings and this section for additional locations of water hammer arrestors.
- E. Use SilvaBrite 100 Lead-Free solder on cold water and hot water piping. Provide non-corrosive, lead-free type flux conforming to ASTM B813 washable.
- F. Provide pipe manufactured by Cerro, Mueller, Anaconda, and Cambridge-Lee Industries with streamlined sweat fittings at each change in direction.
- G. For piping under floor provide Type "K", soft copper with flared fittings in ½" armaflex.
- H. Copper Press Type Fittings:
1. Manufactures, Copper Press Fittings:  
Viega North America, 3 Alfred Circle, Bedford, MA 10730, 877- 843-4262 or  
Ridge Tool Co., 400 Clark Street, Elyria, OH 44036, 800-519-3456
  2. Material:  
ASTM B88 and ANSI/ASME B16.22. O-rings for copper press fittings shall be EPDM.  
Press connections for domestic water copper piping ½" to 2":  
Copper press fittings and installation are to be made in strict accordance with the manufacturers installation instructions. All tubing is to be reamed and de-burred prior to the installation of the fitting. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.  
All valves used within a copper press-fit piping system are to be sweat type as specified under the valve section of this specification. Provide all adaptors necessary to provide sweat ball valves all sizes.  
Provide copper press fit type system on domestic water piping only for pipe sizes ½" to 2".
- I. Installation for pipe and fittings to be in accordance with manufacturer's printed instructions.

## 2.10 WATER HAMMER ARRESTORS

- A. Arresters shall be effective when installed at any angle. Water hammer arresters shall be ANSI/ASSE 1010 2004 certified. Arresters shall be sized and placed per manufacturer's instructions. Provide Products by one of the following:
1. Sioux Chief
  2. PPP
  3. Oatey

- B. Provide water hammer arrestors at each electric solenoid valve location, unless indicated otherwise.
- C. Provide water hammer arrestors at all fixture batteries with more than two (2) fixtures, unless noted otherwise.
- D. Provide stainless steel access panels at all water hammer arrestors, for ease of maintenance.

#### 2.11 DIELECTRIC FITTINGS

- A. Provide NSF/ASSI 61 approved dielectric fittings when changing from ferrous to non-ferrous piping, fittings, valves, etc. Provide Products by one of the following:
  - 1. Watts
  - 2. Everflow
  - 3. Everbilt
- B. Where copper or brass contact ferrous material, provide protective wrapping rubber wrapped around either to avoid electrolysis.

#### 2.12 VALVES (By domestic manufacturer)

- A. The entire plumbing system shall be provided with valves located to permit easy operation, replacement and repair and to permit complete control of all systems under this heading. Throttling valves shall be of the globe type and installed in all lines where regulation or modulation of flow is required. Swing check valves shall be installed in all lines where flow may reverse from that intended.
- B. Valves 2-1/2" over Nibco F-617-0-RW-LF, required at water service entrances.
- C. Check Valves: up to 3" size Provide Products by one of the following:
  - 1. NIBCO
  - 2. Apollo
  - 3. Watts
- D. Ball Valves (Watts, Apollo or Nibco):
  - 1. 1/2" to 2" - Watts No. LF-B-6080, Apollo 77FLF full port.
  - 2. 2-1/2" to 4" - Watts No. LF-B-6000 Apollo 77FLF Series.
  - 3. 1/2" to 2" - Watts No. LF-B-6080-BS Apollo 77CLF-92 full port Balancing Valve.
- E. Provide holes drilled in valve handles for valve tags.
- F. Drain Cocks: Watts LF-B-6000-CC, Apollo 70LF103HC with chain and cap, 1/2 inch draw-off type with Watts #8A Vacuum Breaker.
  - 1. Provide draw-offs at low points.

#### 2.13 NATURAL GAS PIPING:

- A. Provide Schedule 40 black steel piping with black malleable fittings, for piping above slab.
- B. Pitch piping for drainage; install drip and valve and plug at all low points.
- C. Gas piping 2-1/2" and over is to be welded pipe and with butt welded steel pipe fittings.
- D. Valves 1-1/4" to 3": Bronze body screw type ball valve, full port. Provide Products by one of the following:
  - 1. NIBCO
  - 2. Watts
  - 3. Apollo
- E. Valves 1" and smaller: gas cock tee handle Rockford #141 with check pin. Provide Products by one of the following:
  - 1. Rockford
  - 2. Apollo
  - 3. Watts
- F. Valves shall be FM & UL listed for gas service. Metallic Valves, shall comply with ASME B16.33.
- G. Gas safety shut-off valves shall be FM & UL listed, with a visual indicator to note the position of the valve whether "OPEN" or "SHUT".
- H. Valves on gas piping are to be same manufacturer as those used on water piping, including holes in handles for valve tags.
- I. Provide Schedule 40 steel pipe for all gas vent piping off all regulators from all equipment to outside, as required by local gas company; including all vents required at HVAC System.
- J. MEGA-PRESS G PRESS PIPE AND FITTINGS:
  - 1. Material:
    - a. Pipe: Black steel pipe shall conform to ASTM A53, A106 A135 or A795. Pipe schedule (pipe wall thickness) shall conform to the standard referenced dimensions for schedule 40.
    - b. Cold Press Mechanical Joint Fitting shall conform to material requirements of ASTM A420 or ASME B16.3 and performance criteria ANSI/CSA LC4. Sealing elements for press fittings shall be HNBR. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Press ends shall have SC (Smart Connect™) feature design (leakage path). Mega-Press fittings with the Smart Connect Feature assure leakage of liquids and/or gases from inside the system past the sealing element of an un-pressed connection. The function of this feature is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.
    - c. Note: Verify pipe and fittings with applicable codes.
    - d. Piping and fittings shall comply with CSA LC-4 and the latest edition of NFPA-54.

## 2.14 INSULATION

- A. Cold Water: 1 inch fiberglass or approved equal, low pressure pipe insulation, fire retarded with Universal (white) vapor barrier finish. Provide material by Owens-Corning, Johns-Manville or CertainTeed.
- B. Hot Water and Hot Water Return: Insulation similar to cold water.
  - 1. Provide 1" thick insulation on all pipe sizes up to 1 ¼" for all piping over 1 ½" provide 1 ½" thick insulation on all hot water and hot water return piping only.
- C. Fittings and Valve Insulation:
  - 1. Hydraulic setting combination insulating and finishing cement.
  - 2. Molded or fabricated fitting covers of equal thickness and identical in composition to adjacent pipe insulation.
    - a. Zeston Premolded Fittings.
  - 3. All materials, including vapor barrier jackets, glass cloth jackets, adhesives, etc. shall be fire-retardant.
- D. Insulate all water piping and fittings.
- E. Installation shall be in strict accordance with manufacture's written instructions, as shown on the approved shop drawings.
- F. Provide, at all handicapped lavatories and sinks, P-trap and angle stop assemblies "Trap-Wrap Protective Kit #500R-AM" manufactured by Brocar or Truebro Lav Guard. Abrasion resistant cover shall be smooth, with white finish and a minimum 1/8" thick cushioned foam wall insert. Provide concealed fastenings. Provide units to suit offset drains at sinks.

## 2.15 ACCESS PANELS

- A. Provide Type "A" Milcor Style "K" or "M" access panels, Karp or Acudor; sizes as required to obtain access to concealed valves, water hammer arrestors, traps and cleanouts. Provide rated panels in rated walls. Provide stainless steel panels where located in Toilet Rooms.
- B. Provide vandal proof units in all public areas.

## 2.16 PLUMBING FIXTURES

- A. Plumbing fixtures Shall be by the following manufacturers:
  - 1. American Standard
  - 2. Sloan
  - 3. Toto
- B. Provide carriers to suit building construction as manufactured by J.R. Smith, Zurn, Josam, with foot supports anchor all carriers as per the manufacturer's requirements.
- C. Flushometer Valves shall be by the following manufacturers:
  - 1. American Standard



2. Sloan
3. Toto

D. Stainless Steel Sinks: Per the plumbing fixture schedule. No substitutions.

E. Water Closet Seats: American Standard Brands Company.

#### 2.17 MISCELLANEOUS

A. Provide chrome escutcheons and exposed piping.

B. Provide all fixtures supported from wall with 2" x 6" wood blocking concealed, built into wall, and securely fastened. (Unless fixture supports are specified elsewhere. )

C. On all brass closet flanges in addition to lead caulking, provide bronze anchors to floor. Lead caulking and cast iron must be flush with top of caulk flange.

D. Provide McGuire or Chicago heavy duty supplies and stops.

#### 2.18 EQUIPMENT (Furnished by others)

A. Provide all connections with necessary wastes, traps, backflow preventers, cold and hot water, gas, supplies and stops at each piece of equipment or outlet so that each facility can be separately shut down. Provide chrome piping where exposed in finished areas.

### PART 3 - EXECUTION

#### 3.1 WASTE AND VENT PIPING:

A. Fabricated PVC DWV fittings shall conform to ASTM F 1866. All pipe and fittings shall be manufactured in the United States. All systems shall utilize a separate waste and vent system. Pipe and fittings shall conform to NSF International Standard 14.

B. Provide adequate waste from fixtures, evenly pitched and properly secured with adjustable iron hangers. Install all pipes as specified, below grade, and pitch at the rate of 1/4 inch per foot or 1/8 inch per foot as needed to maintain flow to service inverts.

C. Extend all soil and waste pipes out full size through the roof or connected to a common vent above the fixtures as shown. Where vents are located within 10 feet of a fresh air intake, terminate at least 1'-0" above intake.

D. Minimum Roof Vents:

1. Diameter - 3"
2. Height - 18"

E. Bends and Branches:

1. Provide all necessary bends, branches, etc. Make all changes in direction, fixture connections, etc. with Y branches and 45 degree elbows; offsets on vertical lines at an angle not less than 45 degrees with the vertical, being at a less angle

wherever practicable. Use long sweep bends at bottom of stacks. Use certain combination and revent fittings only upon approval, after a specific one or type is submitted for approval.

F. Cleanouts:

1. Provide with brass caps and screws, same size as pipe and screwed gas tight, where indicated and at the ends of all branches, and at each change in direction of horizontal building drain greater than 45 degrees, on soil and waste traps, and in such other portions where cleanouts are required. Provide cleanouts on drain lines at a maximum of 80 feet, unless otherwise indicated.
  - a. Where waste and roof drain stacks enter drains near walls or piers causing difficult access to end cleanouts, provide a horizontal cleanout on stack just above floor, with a long 1/4 inch sweep end at foot of stack. Where such conditions occur in walls or partitions, the cleanout cover shall be accessible through an opening left in wall and covered with a flush type access panel, or as indicated.
  - b. Install cleanouts flush with finished floors.
  - c. Grease and work all cleanouts for ease of maintenance.

3.2 TRAPS AND VENTS

- A. Separately trap every fixture, vent all traps.
- B. Install all trap screws (brass) below water line.
- C. Run the main stacks of back ventilation parallel and as close as possible to the soil pipe stack, and connect to the vent continuation of soil stack at least 6" above rim of the highest plumbing fixture on the stack. Make offsets in vent piping with 45 degree fittings where possible. Pitch horizontal vent lines toward a waste line.
- D. Group vents that are near one another to go through roof, as shown.

3.3 HANGERS AND ANCHORS:

- A. Horizontal Piping: Support the following materials at the following maximum distance intervals:
  1. PVC Pipe: 4 feet.
  2. Threaded Pipe: 10 feet.
  3. Copper Tubing (1-1/2 inch or less): 6 feet.
  4. Copper Tubing (2 inch or over): 10 feet.

3.4 WATER PIPING

- A. Secure and pay for all applications, fees, charges, permits and pay for all fees in connection with the installation of water lines and obtain all approvals.
- B. From flange at floor install meter, etc. as indicated.
- C. Ream all cut tube to full inside diameter of pipe. Install all piping in accordance with

manufacturer's recommendations and requirements, and local water company standards.

### 3.5 VALVES

- A. Provide valves located as follows and as indicated:
  - 1. At foundation wall, both sides of meter, foot of all supply risers, branches to separate fixtures, cold and hot supplies, at hot water storage tanks and wall hydrants.
  - 2. Provide each fixture supply with a separate angle or straight stop, finished like the pipe it serves.
  - 3. At the foot of each riser on the upper side of the control valve, provide a 1/2 Tee and drain cock in addition to valve.

### 3.6 GAS PIPING

- A. Do all work in accordance with the State of Rhode Island Fuel Gas Code and A.G.A. regulations and local ordinances for underground and above ground piping system.
- B. Coordinate with local gas company for installation of new gas service, meter and pay all costs incurred.
- C. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Close equipment shutoff valves before turning off natural gas to premises or piping section.
- E. Inspect natural-gas piping according to NFPA 54 Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.
- F. Comply with NFPA 54 Fuel Gas Code requirements for prevention of accidental ignition.
- G. Install piping free from traps and with drain pocket consisting of nipple and cap at low points for inside building and drip pot for underground piping. Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
- H. Do not use natural-gas piping as grounding electrode.
- I. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.
- J. Install shut-off valves at connection to each piece of equipment. Provide union of equipment side of individual shut-off valve.
- K. Comply with NFPA 54 Fuel Gas Code for installation and purging of natural-gas piping.
- L. Locate all valves, etc. for easy access, service and testing. Install piping free of sags and

bends. Install fittings for changes in direction and branch connections.

- M. Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with approved fire-stop materials.
- N. Install shutoff valves upstream from service meters. Install dielectric fittings downstream from service meters. Install service meters downstream from pressure regulators.
- O. Ream ends of pipes and tubes and remove burrs.
- P. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

### 3.7 INSULATION

- A. Submit samples of each type of material specified herein for approval.
- B. Apply insulation in strict accordance with manufacturer's recommendations.
- C. Provide insulating material with a maximum thermal conductance (C Value) of 0.50, low pressure pipe.
- D. Cold Water: Seal all joints and seams with white or colorless vapor adhesive.
- E. Hot Water and Hot Water Return: Except fastening agent shall be outward clench staples as manufactured by Bostitch.
- F. Insulate fittings, valves, etc., with Fiberglas Aerocors or approved equal, to the same thickness as the adjacent pipe insulation, and finished with the same finish.

### 3.8 DRAINS

- A. Obtain the exact information relative to finish grades at the tops of the drain.

### 3.9 FIXTURES

- A. Grout water closets with sealant.
- B. For above floor discharge water closets, provide sealant at wall as required.
- C. Grout vanities with sealant.
- D. Anchor all shower valve units, heads, tub spouts, etc. to insure no movement is possible.

### 3.10 TESTING

- A. Pressure test piping. All system leaks which occur due to testing are to be repaired at no additional cost to the Owner.
- B. Test all piping and make water-or-gas-tight before insulation is applied, or before

concealment.

1. Sanitary and Storm Piping: Before the installation of any fixtures, cap the ends of the system and fill all lines with water to the roof, 10 LF head will be acceptable, and let stand until a thorough inspection has been made by Local Inspector and the Engineer.
2. Test hot and cold-water piping to a hydrostatic pressure of 125 pounds per square inch for a period of 24 hours.
3. Sterilization of water distribution system; as soon as the water distribution system has been flushed out, sterilize the system in accordance with the requirements of the Health Department having jurisdiction or, in the absence of such, by any other method satisfactory to the Owner. Chlorine used for disinfection is to be NSF 60 certified for potable water use.
4. Test gas piping to 25 psi of air for a period of six (6) hours for above ground installation, and 100 psi for all underground work.

### 3.11 EQUIPMENT CONNECTIONS

- A. Connect plumbing lines to all mechanical equipment and all fixtures of this and other sections of this specification. Provide necessary traps, backflow preventers, tail pieces, stops and supplies, to heating equipment and other appurtenances necessary for a complete installation. All exposed piping in finished rooms to be chrome on brass.

### 3.12 INSTRUCTION OF OWNER'S PERSONNEL

- A. Fully instruct the Owner's representative in the complete operation, adjustment and maintenance of the entire installation as directed. Arrange with the suppliers of installed equipment and/or systems to provide the services of expert technicians to instruct owner's operating personnel in the use, care and emergency repair of equipment and/or systems. The period of instruction will be as to satisfy the Architect and/or Engineer that such instructions have accomplished their purpose.

### 3.13 COLOR CODING AND IDENTIFICATION

- A. Conformance: American National Standards Institute Standard A13.1, "Scheme for the Identification of Piping Systems".
- B. Requirements: Paint on each pipe its contents and flow direction (if flow is in both directions, use double headed arrow).
- C. Locations:
  1. Apply stencil adjacent to each valve.
  2. Apply stencil and arrow on each branch and riser take-off.
  3. Apply stencil and arrow a minimum of 25 feet apart in long continuous lines.
  4. Apply stencil and arrow on lower quarters on pipes or where unobstructed from view.
  5. Apply stencil and arrow at every point of entry or exit thru wall, ceiling or floor.

### 3.14 INSTRUCTION MANUAL

- A. One month prior to the completion of all work and the final inspection of the installation

by the Owner, submit for approval two copies of a complete Instruction Manual, bound in a three-ring binder, typewritten and suitably indexed, containing the following minimum data:

1. List of all equipment with manufacturer's name and model number of each item.
2. Manufacturer's literature describing each item of equipment.
3. Copy of each valve chart.
4. Copy of each automatic control diagram with respective sequence of operation.
5. Parts list of each major item of equipment.
6. Detailed maintenance instructions for each system.

END OF SECTION

## SECTION 230000

### General Provisions for Heating, Ventilating and Air Conditioning Work

#### PART 1 – GENERAL

##### 1.01 WORK INCLUDED

- A. Work in this Section includes the providing of labor, materials, equipment and services necessary for a complete and safe installation in accordance with the contract documents and all applicable codes and authorities having jurisdiction for heating, ventilating and air conditioning work covered by all sections within Division 23 of the specifications (including but not limited to HVAC systems and equipment).
- B. Provide cutting and patching, except as noted in "AIA Document A210" and "Supplementary Conditions for Mechanical and Electrical Work."
- C. Provide piping extensions and connections from capped Plumbing terminations, for makeup water and other such services.
- D. Provide drainage from noted equipment to floor drains, roof, sink, or funnel drains.
- E. Provide piping connections to equipment, as required, for kitchens, sterilizers, kitchenettes, and as indicated.
- F. Provide 3/8" coordinated shop drawings with a sheetmetal construction drawing as the base drawing; and overlay plumbing, fire protection, and electrical systems for coordination.
- G. Related Work And Requirements
  - 1. Requirements of general conditions, supplementary conditions for mechanical and electrical work and Division No. 1.
  - 2. Requirements noted under other Divisions of Work

##### 1.02 WORK NOT INCLUDED:

- 3. Providing temporary heat.
- 4. Providing finish painting.
- 5. Installing building construction access door filler.
- 6. Providing trench covers and frames.
- 7. Cutting and patching, except as noted in "AIA Document A201" and "Supplementary Conditions for Mechanical and Electrical Work."
- 8. Excavating and backfilling under building.
- 9. Excavating and backfilling.
- 10. Providing exterior louvers.
- 11. Providing undercut and louvers in doors.

12. Providing exterior wall louvers intake, screens and exterior attenuation panels.
13. Providing plenums other than sheet metal.
14. Providing flashing.
15. Providing shaft gratings.
16. Providing equipment platforms.

#### 1.03 DESCRIPTION OF BID DOCUMENTS

- A. Specifications, in general, describe quality and character of materials and equipment.
- B. Drawings, in general are diagrammatic and indicate sizes, locations, connections to equipment and methods of installation. Provide additional offsets, fittings, hangers, supports, valves, drains as required for construction and coordination with work of other trades.
- C. Scaled and indicated dimensions are approximate and are for estimating purposes only. Before proceeding with work, check and verify all dimensions.
- D. Make adjustments that may be necessary or requested in order to resolve space problems, preserve headroom, and avoid architectural openings, structural members and work of other trades.
- E. Typical details, where shown on the drawings, apply to each and every item of the project where such items are applicable. Typical details are not repeated in full on the plans, and are diagrammatic only, but with the intention that such details shall be incorporated in full.
- F. If any part of Specifications or Drawings appears unclear or contradictory, consult Architect and/or Engineer for interpretation and decision as early as possible during bidding period. Do not proceed with work without the Architect's and/or Engineer's decision.

#### 1.04 DEFINITIONS

- A. "Furnish" or "provide": to supply, install and make complete, safe, and operable, the particular work referred to unless specifically indicated otherwise.
- B. "Install": to erect, mount and make complete with all related accessories.
- C. "Supply": to purchase, procure, acquire, and deliver complete with related accessories.
- D. "Work": includes labor, materials, equipment, services, and all related accessories necessary for the proper and complete installation of complete systems.



- E. "Piping": includes pipe, tube, fittings, flanges, valves, controls, strainers, hangers, supports, unions, traps, drains, insulation, and all related accessories.
- F. "Wiring": includes raceway, fittings, wire, boxes, and all related accessories.
- G. "Concealed": not in view, installed in masonry or other construction, within furred spaces, double partitions, hung ceilings, trenches, crawl spaces, or enclosures.
- H. "Exposed": in view, not installed underground or "concealed" as defined above.
- I. "Indicated," "shown," or "noted": as indicated, shown or noted on drawings or specifications.
- J. "Similar" or "equal" of base bid manufacturer, equal in quality, materials, weight, size, performance, design and efficiency of specified product, conforming with "Base Bid Manufacturers."
- K. "Reviewed," "satisfactory," "accepted," or "directed" as reviewed, satisfactory, accepted, or directed by or to Architect and/or Engineer.
- L. "Motor Controllers": includes manual or magnetic starters with or without switches, individual pushbuttons or hand-off-automatic (HOA) switches controlling the operation of motors.
- M. "Control or Actuating Devices": includes automatic sensing and switching devices such as thermostats, pressure, float, flow, electro-pneumatic switches and electrodes controlling operation of equipment.

#### 1.05 QUALITY ASSURANCE

- A. All equipment and accessories shall be the product of manufacturers regularly engaged in their manufacture. All items of a given type shall be the products of the same manufacturer.
- B. Furnish all equipment and accessories new and free from defects.
- C. All electrical equipment shall be listed by Underwriters' Laboratories, Inc. (UL) or bear UL labels.
- D. Supply all equipment and accessories in complete compliance with and in accordance with the applicable standards listed in reference standards of this Section and with all applicable national, state and local codes.

#### 1.06 JOB CONDITIONS

A. Inspection of Site Conditions:

1. Before starting work, visit the site and examine the conditions under which the work has to be performed. Report in writing any conditions which might adversely affect the work.

B. Hazardous locations:

1. Provide required material, equipment and installation applicable for hazardous location defined by codes.
2. Provide material, equipment and installation as required for Class, Division and Group noted.

1.07 REFERENCE STANDARDS

A. Published specifications, standards tests, or recommended methods of trade, industry or governmental organizations apply to work in all Sections as noted below:

1. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning engineers.
2. AABC - Associated Air Balance Controls.
3. AMCA - Air Moving and Conditioning Association.
4. ADC - Air Diffuser Council.
5. NEMA - National Electrical Manufacturers' Association.
6. ANSI - American National Standards Institute.
7. ASME - American Society of Mechanical Engineers.
8. ASTM - American Society for Testing and Materials.
9. NFPA - National Fire Protection Association.
10. ARI - Air-Conditioning and Refrigeration Institute.
11. UL - Underwriters' Laboratories, Inc.
12. OSHA - Occupational Safety and Health Administration Regulations.

B. Codes:

1. This installation is to abide by all applicable codes including, but not limited to:
  - a. International Building Code-2009/Maine State Building Code including all amendments.

1.08 SUBMITTALS

A. Submit shop drawings product data, samples and certificates of compliance required by contract documents, "AIA Document 201" and "SUPPLEMENTARY CONDITIONS FOR MECHANICAL AND ELECTRICAL WORK."

B. Operating instructions, maintenance manuals and parts lists.

1. Provide five sets of manufacturer's equipment brochures and service manuals consisting of the following:
  - a. Descriptive literature for equipment and components.
  - b. Model number and performance data.
  - c. Installation and operating instructions.
  - d. Maintenance and repair instructions.
  - e. Recommended spare parts lists.
2. Assemble manufacturers' equipment manuals in chronological order following the specifications' numbering system using heavy duty three ring binders.
3. Submit valve tag chart.

4. Submit three sets of field test reports including instrument set points and normal operating valves.

C. Submit to the Construction Manager all testing and certification documentation as required to comply in all respects with the U.S. Green Building Council/LEED®.

#### 1.09 AS-BUILT DRAWINGS

A. Provide as-built drawings of all work modified from the construction documents in the field during the construction phase.

#### 1.10 CLEARANCE FROM ELECTRICAL EQUIPMENT

A. Piping and ductwork is prohibited in electric and telephone rooms and closets, elevator machine rooms, and for installations over or within 5 ft of transformers, substations, switchboards, motor control centers, standby power plants, and motors.

B. Branch piping to equipment is acceptable when installed over or within 5 ft of motors.

#### 1.11 DRIP PANS

A. Provide drip pans under piping when installation over or within 5 ft of electrical apparatus is unavoidable or in rooms containing electrical equipment. Pan shall be reinforced, properly supported and made watertight. Provide enclosed type for pressure piping. Extend 1-1/4 in. drain pipe from pan to spill over nearest floor drain, janitors sink or as indicated.

1. Construction shall be 18 gauge galvanized sheet steel. Pans shall be constructed to retain 3 inches of water minimum.

2. BMS Contractor shall install a waterflow detector for BMS alarm in case of a water leak.

#### 1.12 PRODUCT, DELIVERY, HANDLING AND STORAGE

A. Ship materials and equipment in crated sections of sizes to permit passing through available space, where required

B. Deliver equipment with protective crating and shrink-wrapped covering.

C. Receive and accept materials and equipment at the site, properly handle, house, and protect them from damage and the weather until installation. Replace equipment damaged in the course of handling without additional charge.

D. Store to prevent damage and protect from weather, dirt, fumes, water, and construction debris in clean dry space

E. Arrange for and provide storage space or area at the job site for all materials and

equipment to be received and/or installed in this project

- F. All exposed openings of equipment, piping and ductwork are to be covered nightly and/or when no work is anticipated for more than 4 hours.
- G. Handle according to manufacturer's written rigging and installation instructions for unloading, transporting, and setting in final location
- H. Protect units from physical damage. Leave factory shipping covers in place until installation

#### 1.13 TEMPORARY HEAT

- A. Temporary heat will be provided under General Construction Work.

#### 1.14 ACCESSIBILITY

- A. Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Minor deviations from the drawings may be made to accomplish this, but changes of substantial magnitude shall not be made without written approval.
- B. Group concealed valves, expansion joints, controls, dampers, and equipment requiring access, so as to be freely accessible through access doors.

#### 1.15 SPECIAL TOOLS

- A. Provide one set of any special tools required to operate, adjust, dismantle or repair equipment furnished under this Division for the Owner's use at the completion of the work.
- B. Provide one pressure grease gun with adapters for each type of grease required.
- C. Provide one suitable tool case for special tools.

#### 1.16 CUTTING AND PATCHING

- A. Provide all carpentry, cutting and patching required for proper installation of materials and equipment specified. Do not cut or drill structural members without review by

Architect and Structural Engineer.

#### 1.17 PROTECTION OF MATERIALS

- A. Protect from damage, water, dust, etc., materials, equipment and apparatus provided under this trade, both in storage and installed

#### 1.18 SUBSTITUTIONS

- A. No substitute material or manufacturer of equipment shall be permitted without a formal written submittal to the Construction Manager and Architect which includes all dimensional, performance and material specifications and is approved in writing by the engineer. Any changes in layout or design brought about by the use of a substitution shall be submitted to the Construction Manager and Architect fully designed for review in conjunction with the submittal of the alternate. Any substitution must be submitted with an explanation why a substitution is being proposed. If the substitute is being proposed for financial reasons, the associated credit must be simultaneously submitted. Final acceptance or rejection of any substitution is subject to the owner's review.

#### 1.19 STANDARDS:

- A. If any item in the specification, as furnished by the contractor, is manufactured in a location which does not certify ASME/ANSI standards, the contractor is to pay the Construction Manager/Owner for ALL expenses incurred by the Construction Manager/Owner for an outside testing company to confirm such compliance.

#### 1.20 COORDINATION

- A. Arrange for pipe spaces, duct spaces, space for equipment, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces.
- D. Provide coordination drawing for all areas of the work. The drawings shall have the following qualities:
  - 1. Minimum 3/8" scale
  - 2. Clearly show all the work for each trade including, but not limited to hangers, valves, dampers, actuators, access doors and service access requirements for all items.
  - 3. Indicate bottom elevations of all ductwork, electrical conduit, raceways, cable trays,

- control wiring and piping.
- 4. Ductwork, piping, and conduit 3 inches and smaller may be shown in single line.
- 5. Ductwork, piping, and conduit greater than 3 inches shall be shown in double line.
- 6. Color scheme:
  - a. Architectural and structural background: Light grey.
  - b. Ductwork: Black.
  - c. Equipment and pads: Purple.
  - d. HVAC piping and equipment: Green.
  - e. Electrical conduits and equipment: Blue.
  - f. Plumbing: Orange.
  - g. Fire protection: Red.
  - h. Control wiring: Pink.

#### 1.21 GUARANTEE

- A. In accordance with General Conditions (AIA Document 201) & Supplementary Conditions for Mechanical & Electrical Work.
- B. The Contractor shall furnish a written guarantee to replace or repair promptly and assume responsibility for all expenses incurred for any workmanship and equipment in which defects develop within one year from the date of final certificate for payment and/or from date of actual use of equipment or occupancy of spaces by Owner included under the various parts of work, whichever date is earlier. This work shall be done as directed by the Owner. This guarantee shall also provide that where defects occur, the Contractor will assume responsibility for all expenses incurred in repairing and replacing work of other trades affected by defects, repairs or replacements in equipment supplied by the Contractor.

#### 1.22 PERMITS AND FEES

- A. In accordance with General Conditions (AIA Document 201) & Supplementary Conditions for Mechanical & Electrical Work.
- B. The Contractor shall give necessary notice, file drawings and specifications with the department having jurisdiction, obtain permits or licenses necessary to carry out this work and pay all fees therefore. The Contractor shall arrange for inspection and test of any or all parts of the work if so required by authorities and pay all charges for same. The Contractor shall pay all costs for, furnish to the Owner before final billing, all certificates necessary as evidence that the work installed conforms with all regulations where they apply to this work.

#### 1.23 RIGGING

- A. This contractor shall provide all required rigging, hoisting and bracing to install the equipment as indicated on the plans. This work shall be performed by an insured certified licensed rigging company that is experienced in rigging equipment of the type indicated for the areas shown on the construction documents. This contractor shall submit rigging plans for approval prior to proceeding with the work.

- B. All permits required from the authorities and agencies involved to perform the rigging are the responsibilities of this contractor.
- C. All structural supports, modifications or additions are to be submitted to the structural engineer for approval prior to proceeding with the work. All supplemental structural supports, elevator charges /modifications, bracing and protection required for the rig is the responsibility of this contractor
- D. The rigging contractor shall hire and pay for all charges and services of the building elevator contractor for the rigging of the equipment

## 1.24 COMMISSIONING

### A. Provisions Included

- 1. Include Division 00 and applicable parts of Division 01 for conditions and requirements which may affect the work of this Section.
- 2. Examine all other Sections of the specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this Section.
- 3. Coordinate work with that of all other Trades affecting, or affected by work of this Section. Cooperate with such Trades to ensure the steady progress of all work under the Contract.
- 4. This scope is not all inclusive of the overall effort necessary to fully commission this project but rather serves as a guide. Refer to the Commissioning Plane and Section provided by the Construction Manager for further details. Refer to Sections 019100-Commissioning and Section 230800- Commissioning of HVAC for further scope and responsibility required.

### B. Commissioning Effort

- 1. The Construction Manager shall be the prime contractor which is responsible for the overall commissioning program.
- 2. The Construction Manager and all Contractors/Subcontractors shall completely assist the Commissioning Agent in establishing and maintaining the schedule of commissioning events, as developed for the complete check out of each individual mechanical and electrical sub-system and the integration of all building systems.
- 3. The Contractor, BMS Contractor and TAB Contractor responsible for all work, installation, testing, balancing and controls under this Division shall be responsible to provide all set up, testing and services required in the commissioning of the systems under this Division.

### C. Commissioning Team

- 1. A representative of each of the following parties shall be designated as a member of the Commissioning Team.
- 2. Each member must attend weekly "schedule of events" meetings, in accordance with the Commissioning Agent's schedule.
- 3. Each member must be closely associated with this design project to accommodate the actual scheduling of events upon mechanical and electrical systems which have been "completed" and thus in proper operation to be commissioned.
- 4. Commissioning Team
- 5. Commissioning Agent
  - a. Construction Manager

- b. HVAC Contractor
- c. BMS Contractor
- d. Testing and Balancing Contractor (TAB)
- e. Plumbing Contractor
- f. Fire Protection Contractor
- g. Electrical Contractor
- h. Selective Equipment Manufacturers
- i. Owners Designated Representative

D. Substantial Completion

- 1. The Construction Manager shall submit written notice that the project is substantially complete. Provide a detailed punch list of items not yet in conformance with the contract documents which require attention.
- 2. Submit preliminary copies of the Operation and Maintenance Manuals.
- 3. Submit the as-built drawings.
- 4. Submit warranties, workmanship/maintenance bonds, maintenance agreements, final certifications, and similar documents.
- 5. Obtain and submit releases enabling Owner's full and unrestricted use of the work and access to services and utilities, including occupancy permits, operating certifications, and similar releases.
- 6. The Contractor shall have completed all commissioning requirements in Division 21, 22, 23 and 26 except Functional Performance Testing of systems.
- 7. The Contractor shall have completed all training required for Owner's staff.
- 8. Submit a letter to the Architect requesting inspection and the Certificate of Substantial Completion, which will be signed and submitted to the Owner.

E. Functional Completion

- 1. The Construction Manager shall submit commissioning acceptance procedures test check-off sheets, signed by the Commissioning Agent, and the Commissioning Agent's letter recommending Functional Completion.
- 2. Formal records of all test procedures and results shall be included, as specified, in binders organized for convenient future reference by the Owner's operations staff.
- 3. The Commissioning Agent will submit a final commissioning report recommending Function Completion when all requirements have been met and when the final report is accepted by the Client. The Commissioning Agent's report will be a comprehensive summary regarding the commissioning program, which shall also include formal records and data accumulated by the Commissioning Agent during the commissioning process.
- 4. All Contractors shall participate in assisting the commissioning agent in indicating system compliance by performance ALL system tests to the satisfaction of the commissioning agent.

F. Final Completion And Final Acceptance

- 1. Final Completion occurs when the work is fully and finally completed in accordance with the Contract Documents and all deficiencies have been corrected. Final Acceptance is the written acceptance issued to the Contractor by the Construction Manager and Owner after the Contractor has achieved Final Completion. The specific requirements are:
  - a. Submit "Consent of Surety to Final Payment". This letter is to be completed by the surety and mailed to the Owner.
  - b. Submit final payment request with final releases and supporting documentation not previously submitted or accepted.
  - c. Submit a copy of the Architect's final punch list of itemized work to be



- completed or corrected, stating that each item is complete (or otherwise resolved) for acceptance, endorsed and dated by the Architect.
- d. Deliver tools, spare parts, extra stock of materials, and similar physical items to the Owner.
  - e. Make the final change-over of locks and transmit the new keys to the Owner. Return any loaned construction access keys. Advise Owner's personnel regarding change-over in security provisions.
  - f. Discontinue and remove from the project site temporary facilities and services, along with construction tools and facilities, mock-ups, and similar elements.
  - g. Complete final cleaning requirements, including touch-up of marred surfaces, and repair, restore and touch-up exposed finishes.
  - h. Submit a letter to the Architect requesting inspection and the Certificate of Final Acceptance, which will be signed and submitted to the Owner.

#### G. Commissioning Schedule

1. The Construction Managers schedule for construction, control implementation and completion, start, and point-by-point checkout must be complete for Owner occupancy, in accordance with the Construction Managers schedule.

#### H. Responsibilities

1. The Contractors shall cooperate with the Construction Manager and Commissioning Agent to accomplish the following tasks:
  - a. Review and approve all functional performance tests, results, and documentation required by the contract documents, for all equipment and systems, as performed by subcontractors, vendors, etc.
  - b. Develop schedules for all testing, integrate testing into the master construction activity schedule and coordinate all subcontractor testing as required.
  - c. Assist and participate in all equipment tests, system functional tests, and cross system functional tests. Test procedures shall be in accordance with equipment manufacturer's recommendations, where applicable. Test procedures shall fully describe system configuration and steps required for each test, appropriately documented so that another party can repeat the tests with virtually identical results.
  - d. Submit test procedure schedule, procedures, forms and other documentation to the Construction Manager and Owner for approval three months prior to starting any testing required and stipulated by the construction Manager.
  - e. Coordinate directly with subcontractor on the project specific to their responsibilities and contractual obligations.
  - f. Provide qualified personnel for participation in commissioning tests, including seasonal testing required after the initial commissioning.
  - g. Provide engineering and technical expertise to oversee and direct the correction of deficiencies found during the commissioning process.
  - h. Provide all start-up and initial testing of all systems and equipment by the Contractor and subcontractors, and then all final tests of equipment and systems in accordance with the Commissioning Agent procedures.
  - i. Manage all cross system testing such as HVAC, building fire alarm, emergency power, life safety, elevators, etc.

- j. Note any inconsistencies or deficiencies in system operations and enforce system compliance or recommend to the Architect modifications to system design which will enhance system performance.
  - 1) Coordinate with the Commissioning Agent and Construction Manager the required A/E and Owner testing participation and approval procedures, after verifying that pretests have been satisfactorily conducted and final testes are ready to be performed.
  - 2) In the event that a functional test fails, the cause of failure shall be determined and rectified as soon as possible, and then retested. If more than three functional tests of the same system(s) are required, the Contractor shall reimburse all associated costs for the extraordinary participation of the A/E, Commissioning Agent, Construction Manager and Owner's staff, as required by the particular test being performed.
  - 3) Review operation and maintenance information and as-built drawings provided by the various subcontractors and vendors for verification, organization and distribution.
  - 4) Obtain all documentation from tests and assemble a final test report to be submitted to the Construction Manager, Commissioning Agent, Architect and the Owner for approval.
  - 5) Oversee and/or provide training for the systems specified in the Division with coordination by the Division 23 Subcontractors.

I. Related Work

- 1. All start-up and testing procedures and documentation requirements specified within Divisions 21, 22, 23 and 26.
- 2. The Test, Adjust and Balance (TAB) firm shall provided the following:
  - a. Allow sufficient time before final commissioning dates so that testing, adjusting and balancing can be accomplished.
  - b. Put all heating, ventilating and air conditioning equipment and systems into full operation and continue the operation during each working day of testing, adjusting and balancing and commissioning so they are fully functional. This includes the complete installation of all equipment, materials, pipe, duct, wire, insulation, controls, etc., per the contract documents and related directives, clarifications, change orders, etc.
- 3. A commissioning plan will be developed by the Commissioning Agent. Divisions, 21, 22, 23 and 26 are obligated to assist the Commissioning Agent in preparing the commissioning plan by providing all necessary information pertaining to the actual equipment and installation. If system modifications/clarifications are in the contractual requirements of this and related sections of work, they will be made at no additional cost to the Owner. If Contractor initiated system changes have been made that alter the commissioning process, the Test Engineer will notify the Commissioning Agent and Owner's Representative for approval.
- 4. Normal start-up services required to bring each system into a fully operational state. This includes cleaning, filling, purging, leak testing, motor rotation check, control sequences of operation, full and part load performance, etc. The TAB firm will not begin the TAB work until each system is complete, including normal contractor start-up. The Commissioning Agent will not begin the commissioning process until each system is complete, including normal contractor start-up and the TAB work has been completed.
- 5. Provide labor and material to make corrections when required, without undue delay.
- 6. The HVAC Contractor shall include the cost of exchanged sheaves and belts as may be required by the TAB firm.

7. Provide test holes in ducts and plenums where directed or necessary for pitot tubes to take air measurements and to balance the air systems. Test holes shall be provided with an approved removable plug or seal. At each location where ducts or plenums are insulated, test holes shall be provided with an approved extension with plug fitting.
8. Provide pressure and temperature taps as indicated on construction documents in locations as required by the TAB firm to adequately test and/or balance the hydronic systems.
9. The Contractor shall include a minimum of two week "flush out" period, in which the air handling systems are sequenced into a 100% outside air mode, to assist in the removal of any construction material off-gasing, in accordance with LEEDS.

J. Test Equipment

1. Provide test equipment as necessary for start-up and commissioning of the mechanical equipment and systems. The TAB firm will provide the test equipment required to perform their service.

K. Test Equipment - Proprietary

1. Proprietary test equipment required by the manufacturer, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist the Commissioning Test Engineer in the commissioning process. Proprietary test equipment shall become the property of the Owner upon completion of commissioning.
2. Identify the proprietary test equipment required in the test procedures submittals and in a separate list of equipment to be included in the operations and maintenance manuals.

L. Work Prior To Commissioning

1. Complete all phases of work so the system can be started, tested, adjusted, balanced, controlled and otherwise commissioned. Divisions 21, 22, 23 and 26 have primary start-up responsibilities with obligations to complete systems, including all sub-systems completion will not relieve these Divisions from completing those systems as per the Construction and Commissioning schedule.

M. Work To Resolve Deficiencies

1. In some systems, mis-adjustments, misapplied equipment and/or deficient performance under varying loads will result in additional work being required by the Contractors to commission the systems. This work will be completed under the direction of the Construction Manager, Architect and Owner's Representative, with input from the Contractor, equipment supplier, and Commissioning Agent. Whereas all members will have input and the opportunity to discuss the work and resolve problems, the Architect will have final jurisdiction on the necessary work to be done to achieve performance.
2. Corrective work shall be completed in a timely fashion to permit timely completion of the commissioning process. Experimentation to render system performance will be permitted. If the Commissioning Agent deems the experimentation work to be ineffective or untimely as it relates to the commissioning process, the Commissioning Agent will notify the Owner indicating the nature of the problem, expected steps to be taken, and the deadline for completion of activities. If deadlines pass without resolution of the problem, the Owner reserves the right to obtain supplementary services and/or equipment to resolve the problem. Costs incurred to solve the problems in an expeditious manner will be the Contractor's responsibility.

N. Seasonal Commissioning and Occupancy Variations

1. Seasonal commissioning pertains to testing under full-load conditions during peak heating and peak cooling seasons, as well as part-load conditions in the spring and fall. Initial commissioning will be done as soon as contract work is completed regardless of season. Subsequent commissioning may be undertaken at any time thereafter to ascertain adequate performance during the different seasons.
2. All equipment and systems will be tested and commissioned in a peak season to observe full-load performance. Heating equipment will be tested during winter design extremes. Cooling equipment will be tested during summer design extremes, with a fully occupied building. Each Contractor and supplier will be responsible to participate in the initial and the alternate peak season test of the systems required to demonstrate performance, as scheduled by the Commission Agent, with three day (minimum) advance notification.
3. Subsequent commissioning may be required under conditions of minimum and/or maximum occupancy or use. All equipment and systems affected by occupancy variations will be tested and commissioned at the minimum and peak loads to observe system performance. The Contractor will be responsible to participate in the occupancy sensitive testing of systems to provide verification of adequate performance.

O. Recommissioning

1. Upon notification by the Commissioning Agent of successful system/equipment performance/checkout test, the Owner shall witness Test No. 1. If any system/equipment/component/device fails to perform correctly during Test No. 1, the Contractor and/or equipment supplier must correct any systems/wiring deficiencies, and must incur any travel/airfares/food/hotel expenses of the designated Agent, to be available for the Retest No. 1.

P. Training

1. Participate in the training of the Owner's engineering and maintenance staff, as required in Divisions 01, 21, 22, 23 and 26, on each system and related components. Training, in part, will be conducted in a classroom setting, with system and component documentation, and suitable classroom training aids.
2. Training will be conducted jointly by the Commissioning Agent, the Contractor, and the equipment vendors. The Test Engineer will be responsible for highlighting system peculiarities specific to this project.

Q. Systems Documentation

1. In addition to the requirements of Division 01, The Contractor shall update contract documents to incorporate field changes and revisions to system designs to account for actual constructed configurations. All drawings shall be red-lined on two sets. Divisions 21, 22, 23 and 26 as-built drawings shall include architectural floor plans, elevations, and details, and the individual mechanical or electrical systems in relation to actual building layout.
2. Maintain as-built red-lines as required by Division 01. Given the size and complexity of this project, red-line drawings at completion of construction, based on memory of key personnel, is not satisfactory. Continuous and regular red-lining of drawings is considered essential and mandatory.

R. Miscellaneous Support

1. Divisions 21, 22, 23 and 26 shall remove and replace covers of mechanical equipment, open access panels, etc., to permit the Commissioning Agent, Architect and Owner's representative to observe equipment and controllers provided. Furnish ladders and flashlights as necessary.

S. Systems To Be Commissioned

1. HVAC
  - a. Each exhaust fan.
  - b. Each supply fan.
  - c. Each return fan.
  - d. Each supply air unit including verification of all air and water flows at each coil and filter.
  - e. Each air flow station.
  - f. Each Variable Frequency Drive.
  - g. Cabinet and unit heaters.
  - h. Each water flow measuring station/flow meter.
  - i. Each DDC terminal box and induction box.
  - j. Each Circulating Pump.
  - k. Tele/Data A.C.System.
  - l. Verify the final accuracy of the air and water test and balancing report.
  - m. Verify the air distribution of the operating rooms system for both summer and winter operations. (temperature, humidity and pressurization)
  - n. BMS functional and operational control sequences.
  - o. Moisture sensor system at drain pans.
  - p. Each individual lighting control interface.
  - q. Each kilowatt metering interface.
2. Plumbing/Fire Protection
  - a. Domestic Water Heaters (Potable).
  - b. Each alarm valve.
  - c. Flow Restriction Devices
  - d. Reduced Pressure Backflow Devices
3. Electrical
  - a. Circuit breaker trip setting verification.
  - b. Lighting controls.
  - c. Fire alarm interface to HVAC/ATC.
  - d. Security interface.
  - e. Elevator fire alarm control system.
  - f. Emergency Power

T. Post Occupancy Commissioning

1. This Contractor shall fully cooperate in all regards with this phase of commissioning.
2. The Commissioning Agent will prepare a complete building operations review within ten (10) months after substantial completion with the owners operating personnel and note in the report any outstanding construction and/or operational deficiencies that are identified during this post occupancy review. This report shall be provided to the owner, Construction Manager and A/E. This Post-Occupancy deficiency list shall be corrected by the Construction Manager under the one year guarantee/warranty period and shall be submitted as being completed by the Contractor and Equipment Suppliers. The Commissioning Agent shall also procure all equipment manufacturer test data verifying post-occupancy equipment efficiencies and compare all such data to the information published by the manufacturer. This data shall be used to verify overall equipment efficiency against the contract specifications.
3. Divisions 21, 22, 23 and 26 shall correct any and all system deficiencies noted by the Commissioning Agent during the first one year after substantial completion and as noted by the Commissioning Agent during the 10th month building operating review.

U. LEED Point Initiative

1. It is the intent of the Owner to install, test, commission and operate the building systems in accordance with USGBC LEED-NC for new construction. This contractor shall be responsible for all submittal data, testing, flush-out, reporting and verification necessary during the construction, close-out and post commissioning to comply with the following USGBC LEED credits for HVAC systems:
  - a. Energy and Atmosphere Credit 3- Cooperation and Documentation for Enhanced Commissioning and Credit 5-Measurement and Verification Documentation.
  - b. Indoor Environmental Quality Credits 1- Outdoor Air Delivery Monitoring, Credit 3.2- Construction IAQ Management Plan (Before Occupancy), Credit 4.1- Low-Emitting Materials (Adhesive and Sealants), Credit 5- Indoor Chemical and Pollutant Source Control and Credit 7.2- Thermal Comfort Verification.

PART 2 – PRODUCTS

2.01 BASE BID MANUFACTURERS

- A. Base bid on materials or equipment are specified by name of manufacturer, brand or trade name and catalog reference.
- B. The choice will be optional with bidder where two or more manufacturers are named.
- C. The following are base bid manufacturers for items under this Section:
  1. Access doors: Karp Associates, Inc., Higgins Mfg. Co., Milcor Steel Co., and Walsh-Spencer Co.
  2. Inserts: F and S Mfg Co., Fee and Mason and Grinnell.
  3. Hangers and supports: I.T.T. Grinnell, Carpenter and Patterson, Inc., and Fee & Mason.
  4. Paint: Sherwin-Williams, Pittsburgh Paint Co., Pratt and Lambert, and Rust-Oleum.
  5. Gratings: Irving Grating IKG Industries and Ryerson - Inland Steel Co.

2.02 INSERTS AND SUPPORTS

- A. Support all HVAC work from building construction by providing inserts, beam clamps, steel fishplates (in concrete fill only), and acceptable brackets. Submit all methods for review.
- B. Provide trapeze hangers of bolted angles or channels for grouped lines and services.
- C. Provide additional framing where building construction is inadequate. Submit for review.
- D. Inserts shall be steel, slotted type and factory-painted.
  1. Single rod shall be similar to Grinnell Fig. 281.
  2. Multi-rod shall be similar to Fee & Mason Series 9000 with end caps and closure strips.
  3. Clip form nails flush with inserts.
  4. Maximum loading including pipe, contents and covering shall not exceed 75 percent of rated insert capability.

- E. Supports from steel decks:
  - 1. Pipes:
    - a. Sizes up to 3" diameter maximum hanger spacing: 10' centers maximum.
    - b. Beyond 3" diameter provide support steel, hanger spacing: 10' centers.
  - 2. Ductwork:
    - a. Hangers spacing: maximum 10' centers and/or every change in direction.

#### 2.03 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS:

- A. Furnish supplementary steel, channels and supports required for proper installation, mounting and support of all HVAC work.
- B. Connect supplementary steel and channels firmly to building construction in an acceptable manner.
- C. Determine type and size of supporting channels and supplementary steel. Supplementary steel and channels shall be of sufficient strength and size to allow only a minimum deflection in conformance with manufacturer's requirements of loading.
- D. Install supplementary steel and channels in a neat and workmanlike manner parallel to walls, floors, and ceiling construction.
- E. All supplementary steel, channels, supports shall be submitted to Structural Engineer for review.

#### 2.04 EXPANSION ANCHORS

- A. Provide smooth wall, non-self-drilling internal plug expansion type anchors constructed of AISC 12L14 steel and zinc plated in accordance with Fed. Spec. QQ-A-325 Type 1, Class 3.
- B. Do not exceed 1/4 of average values for a specific anchor size using 2000 psig (13,800 kpa) concrete only, for maximum working load.
- C. Provide spacing and install anchors in accordance with manufacturer's recommendations.

#### 2.05 ACCESS DOORS

- A. This contractor shall submit to the architect for approval a plan indicating the size (minimum 18" x 18") and location of all building construction access doors required for operation and maintenance of all concealed equipment, devices, valves, dampers and controls. Contractor shall arrange for furnishing of all access doors in finished construction and include costs in the bid.

- B. Flush type access doors shall be similar to Karp Type DSC-211 with No. 13 USSG steel doors and trim and No. 16 USSG steel frame, metal wings for keying into construction, concealed hinges and screwdriver operated stainless steel cam lock. Provide lift off type access doors, similar to Karp Type DSC-212, where door cannot swing open.
- C. In acoustic tile ceilings, factory finished white access doors shall be similar to Karp Type DSC-210, with No. 13 USSG steel frame, No. 16 USSG steel pan door suitable for receiving tile thickness and hinges that are not visible when door is closed. Access door shall have screwdriver operated stainless steel cam locks finishing flush with tile with a minimum of 2 per door.
- D. In plaster ceilings recessed access doors shall be similar to Karp DSC-210-PL, with recess to receive plaster.
- E. In fire rated construction provide fire rated access doors, similar to Karp KRP-150-FR, in accordance with applicable code requirements.
- F. Access doors shall have one coat of shop-painted zinc chromate primer.

#### 2.06 ACCESS TILE IDENTIFICATION:

- A. In removable ceiling tiles, provide buttons, tabs, and markers to identify location of concealed work. Submit for review.

#### 2.07 EQUIPMENT PLATFORMS

- A. Equipment platforms will be provided under General Construction Work.

#### 2.08 LADDERS

- A. Ladders will be provided under General Construction Work except those inside air handling units which shall be provided as an integral part of the unit.

#### 2.09 SHAFT GRATINGS

- A. Shaft gratings will be provided under General Construction Work.

#### 2.10 TAGS:

- A. Provide 2 in. round valve tags on all valves and controls of No. 18 BS gauge aluminum with stamped numbers and letters filled in with black paint.

- B. Indicate identifying number and system letter on tags, and fasten by heavy aluminum



or brass "S" hooks or chains.

- C. Tags shall be similar to Seton Name Plate Corporation.

## 2.11 CHARTS

- A. Provide valve tag chart indicating valve number, system, type, size, location and function for all valves.
- B. Mount in aluminum frame and glass.
- C. Letter and number valves and controls to correspond with designations on metal tags.
- D. Fasten charts permanently in locations, as directed, with four brass screws.

## 2.12 NAMEPLATES

- A. Provide nameplates with inscriptions, subject to review, indicating building abbreviations, equipment number and capacity (CFM and/or GPM). Fasten with epoxy cement or chrome plated screws. Nameplate shall be black Lamicaid sheet with white lettering.

## PART 3 - EXECUTION

### 3.01 MECHANICAL IDENTIFICATION

- A. Refer to identification Section.

### 3.02 FOUNDATIONS

- A. Foundations and concrete will be provided under General Construction Work.
- B. Coordinate foundations for:
  1. Pumps.
  2. Fans.
  3. Air handling units and floor mounted plenums.
  4. Floor mounted control panels.
  5. Motor controllers; VFD's, Disconnect Switches, etc.
  6. Motors.
  7. Air cooled chillers and/or compressor/condensers units.
  8. Control Panels.
  9. Boilers
  10. Vertical Stacks.

3.03 WATERPROOFING

- A. Waterproofing will be provided under General Construction Work.

3.04 FIELD QUALITY CONTROL

- A. Perform tests as noted, and in the presence of Architect and/or Construction Manager, Engineer and authorities having jurisdiction.
- B. Provide required labor, material, equipment, and connections necessary for tests and submit results for review.
- C. Repair or replace defective work and pay for restoring or replacing damaged work due to tests, as directed.

3.05 CLEANING

- A. Brush and clean work prior to concealing, painting and acceptance. Perform in stages if directed.
- B. Clean and repair painted exposed work, soiled or damaged, to match adjoining work before final acceptance.
- C. Remove debris from inside and outside of material and equipment.

END OF SECTION

## SECTION 23 05 00

### Common Work Results for HVAC

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Piping materials and installation instructions common to most piping systems.
  - 2. Transition fittings.
  - 3. Dielectric fittings.
  - 4. Mechanical sleeve seals.
  - 5. Sleeves.
  - 6. Escutcheons.
  - 7. Grout.
  - 8. Equipment installation requirements common to equipment sections.
  - 9. Painting and finishing.
  - 10. Concrete bases.
  - 11. Supports and anchorages.

##### 1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
  - 1. CPVC: Chlorinated polyvinyl chloride plastic.
  - 2. PE: Polyethylene plastic.
  - 3. PVC: Polyvinyl chloride plastic.
- G. The following are industry abbreviations for rubber materials:
  - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
  - 2. NBR: Acrylonitrile-butadiene rubber.

#### 1.4 SUBMITTALS

- A. Product Data: For the following:
  - 1. Transition fittings.
  - 2. Dielectric fittings.
  - 3. Mechanical sleeve seals.
  - 4. Escutcheons.
- B. Welding certificates
- C. Welding: Before proceeding, submit the following for review and approval;
  - 1. Proposed procedure conforming to latest revision of:
    - a. ANSI/ASME B31.1, Pressure Piping Chapter V.
    - b. ANSI/ASME B31.9, Building Services Piping
    - c. ANSI 249.1 Safety in Welding and Cutting
  - 2. List of welders qualified per section IX of ASME. Boiler and Pressure Vessel Code including, but not limited to, the following information:
    - a. Welder's name
    - b. Welder's Social Security Number
    - c. Employer's name
    - d. Name of testing laboratory
    - e. Procedure tested for including, but not limited to, the following:
      - 1) Date of test
      - 2) Wall thickness
      - 3) Base metal material
      - 4) Electrode
      - 5) Position
    - f. Procedure tested for including, but not limited to, the following:
      - 1) Type of test performed
      - 2) Result of test
      - 3) Welder's identification symbol
      - 4) Sample of each identification device
      - 5) Certify that each welder has either worked in the procedure or successfully tested in the procedure within the past six month
  - 3. No reports from any welding inspection agency shall be accepted unless each agency has first requested and obtained qualifications from the office in accordance with rule 16-1 of the Board of Standards and Appeals welding rule.
- D. Brazing: Before proceeding, submit the following for review and approval;
  - 1. Proposal procedure conforming to latest revision of:
    - a. Section IX, ASME Boiler and Pressure Vessel Code, Welding and Brazing Qualifications.
    - b. ANSI/AWS B2.2 Standard for Brazing Procedure and Performance Qualification
  - 2. List of brazers qualified per section IX of ASME. Boiler and Pressure Vessel Code including, but not limited to, the following information:
    - a. Brazer's name
    - b. Brazer's Social Security Number
    - c. Employer's name
    - d. Name of testing laboratory
    - e. Procedure tested for including, but not limited to, the following:
      - 1) Date of test
      - 2) Wall thickness
      - 3) Base metal material
      - 4) Brazing filler material
      - 5) Position
      - 6) Type of test performed
      - 7) Result of test

- 8) Brazer's identification symbol
- 9) Sample of each identification device
- 10) Certify that each Brazer has either worked in the procedure or successfully tested in the procedure within the past six months

#### 1.5 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
  1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
  2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

#### 1.7 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
  2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

## 2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 23 Piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

## 2.3 JOINING MATERIALS

- A. Refer to individual Division 23 Piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
  - 2. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

## 2.4 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: In lieu of dielectric unions, use brass unions between different pipe materials.

## 2.5 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
  - 1. Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Metraflex Co.
    - d. Pipeline Seal and Insulator, Inc.
    - e. Thunderline Link-seal
  - 2. Sealing Elements: NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  - 3. Pressure Plates: Stainless steel. Include two for each sealing element.
  - 4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## 2.6 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
  - 1. Underdeck Clamp: Clamping ring with set screws.

## 2.7 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
  - 1. Finish: Polished chrome-plated.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
  - 1. Finish: Polished chrome-plated.
- E. One-Piece, Stamped-Steel Type: With spring clips and chrome-plated finish.
- F. Split-Plate, Stamped-Steel Type: With concealed hinge, spring clips, and chrome-plated finish.
- G. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

## 2.8 GROUT

- A. General Purpose Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
  - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  - 2. Design Mix: 14000 / 19000-psi, 36 hours @70 degrees compressive strength.
  - 3. Packaging: factory packaged for field mixing.
- B. Pump Mounting: High flow, high strength epoxy machine-based grout: ASTM C 881, CRD-C 590.
  - 1. Characteristics: Two to Three-component, highly flowable, epoxy-based grout that produces high performance strength plus chemical inertness and excellent bonding properties.
  - 2. Design Mix: ASTM-C 579, 14,000 / 19,000 psi , 36 hours @72 degree F compressive strength.
  - 3. Packaging: Factory packaged for field mixing.
  - 4. Products: Chocfast by ITW Philadelphia resins, ESCOWELD or approved equal.

## PART 3 - EXECUTION

### 3.01 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
  - 1. New Piping:
    - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
    - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
    - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
    - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    - g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type and set screw.
    - h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    - i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with spring clips.
    - j. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
    - k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with spring clips.
    - l. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
- M. Sleeves are not required for core-drilled holes except at all Penthouse and/or roof penetrations.
- N. Permanent sleeves are not required for holes formed by removable PE sleeves except at all Penthouse and/or roof penetrations.
- O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of the Penthouse and/or mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.



2. Install sleeves in new walls and slabs as new walls and slabs are constructed. Air seal all penetrations at all supply and return air plenums.
  3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
    - b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions 16 Gauge
      - 1) Seal space outside of sleeve fittings with grout.
  4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
- Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Install steel pipe for sleeves smaller than 6 inches in diameter.
  2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
  3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- R. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.
- T. Verify final equipment locations for roughing-in.
- U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- 3.02 PIPING JOINT CONSTRUCTION
- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
  - B. Ream ends of pipes and tubes and remove burrs. Bevel or groove (on applicable systems) plain ends of steel pipe.
  - C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
  - D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
  - E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
  - 3. Threaded fittings not allowed in glycol system.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Grooved Joints: Install in accordance with the manufacturer's (Victaulic or Engineer Approved Equal) guidelines and recommendations. All grooved couplings, fittings, valves and specialties shall be supplied by a single manufacturer. Grooving tools shall be supplied by the same manufacturer as the grooved components. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be developed and supplied by the manufacturer. Grooved end shall be clean and free from indentations, projections and roll marks in the area from pipe end to groove. A Victaulic factory trained field representative shall provide on-site training to contractor's field personnel in the installation of grooved piping products. Factory trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.
  - 1. Install the Victaulic AGS piping system in accordance with the latest Victaulic installation instructions. Use Victaulic grooving tools with AGS roll sets to groove the pipe. Follow Victaulic guidelines for tool selection and operation. Coupling installation shall be complete when visual metal-to-metal contact is reached. AGS products shall not be installed with standard grooved end pipe or components. Installing AGS products in combination with standard grooved end products could result in joint separation and/or leakage.
  - 2. Grooved joints not allowed on Hot Water system

### 3.03 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
  - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
  - 2. Install flanges, or grooved joints, in piping NPS 2-1/2 and larger, adjacent to flanged or grooved end valves and at final connection to each piece of equipment.
  - 3. Dry Piping Systems: Install brass unions to connect piping materials of dissimilar metals.
  - 4. Wet Piping Systems: Install brass unions to connect piping materials of dissimilar metals.

### 3.04 DUCT SYSTEMS – COMMON REQUIREMENTS

- A. Install ductwork according to the following requirements and Division 23 Sections specifying metal ducts, casings, duct accessories and related components.
- B. Drawing plans, schematics and diagram indicate general location and arrangement of duct systems. Indicated locations and arrangements were used to size ducts and calculate friction loss, expansion, fan sizing and other design considerations. Install ductwork as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install ductwork in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

- D. Install ductwork indicated to be exposed and ductwork in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install ductwork above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install ductwork to permit servicing of C.V. boxes, VAV boxes, dampers, actuators, filters, valves, and as required.
- G. Install with indicated horizontal and vertical offset.
- H. Install ductwork free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install ductwork to allow application of insulation.
- K. Select system components with pressure class equal to or greater than system operating pressure.

### 3.05 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

### 3.06 PAINTING

- A. Painting of HVAC systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### 3.07 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
  1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
  2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
  3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
  4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  5. Install anchor bolts to elevations required for proper attachment to supported equipment.
  6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

### 3.08 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

### 3.09 GROUTING

- A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION

## SECTION 23 05 29

### Hangers And Supports for HVAC Piping and Equipment

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.02 SUMMARY

- A. This Section includes the following hangers and supports for HVAC system piping and equipment:
  - 1. Steel pipe hangers and supports.
  - 2. Trapeze pipe hangers.
  - 3. Metal framing systems.
  - 4. Thermal-hanger shield inserts.
  - 5. Fastener systems.
  - 6. Equipment supports.
- B. Related Sections include the following:
  - 1. Division 23 Section " Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.
  - 2. Division 23 Section " Vibration and Seismic Controls for HVAC Piping and Equipment" for vibration isolation devices.
  - 3. Division 23 Section(s) "Metal Ducts" for duct hangers and supports.

##### 1.03 DEFINITIONS

- A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

##### 1.04 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- C. Design seismic-restraint hangers and supports for piping and equipment.

##### 1.05 SUPPLEMENTARY STEEL

- A. Furnish supplementary steel as required for proper installation, mounting and support of HVAC work.
- B. Connect supplementary steel firmly to building construction in an acceptable manner.

- C. Determine type and size of supplementary steel. Supplementary steel shall be of sufficient strength and size to allow a minimum deflection of 1/360 of the span and in conformance with manufacturer's requirements of loading.
- D. Install supplementary steel in a neat and workmanlike manner parallel to walls, floors and ceiling construction.
- E. All supplementary steel and channel supports shall be submitted to the structural engineer for review

#### 1.06 EXPANSION ANCHORS

- A. Provide smooth wall, non-self-drilling internal plug expansion type anchors constructed of AISC 12L14 steel and zinc plated in accordance with Fed. Spec. QQ-A-325 Type 1, Class 3.
- B. Do not exceed 1/4 of average values for a specific anchor size using 2,000 psig (13,800 kpa) concrete only for maximum working load.
- C. Provide spacing and install anchors in accordance with manufacturer's recommendations.

#### 1.07 SUBMITTALS

- A. Product Data: For the following:
  1. Steel pipe hangers and supports.
  2. Thermal-hanger shield inserts.
  3. Powder-actuated fastener systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
  1. Trapeze pipe hangers. Include Product Data for components.
  2. Metal framing systems. Include Product Data for components.
  3. Equipment supports.
- C. Submit to the structural engineer:
  1. Details of all proposed methods of attachment to the building structure for all hangers and supports.
  2. All forces and weights that will be imposed on the building structure by the hangers and supports.
- D. Welding certificates.

#### 1.08 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
- B. Welding: Qualify procedures and personnel according to the following:
  1. AWS D1.1, "Structural Welding Code--Steel."
- C. Engineering Responsibility: Design and preparation of Shop Drawings and calculations for each multiple pipe support, trapeze, and seismic restraint by a qualified professional engineer.

1. 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 hangers and supports that are similar to those indicated for this Project in material, design, and extent

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

### 2.02 STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Manufacturers:
  1. AAA Technology & Specialties Co., Inc.
  2. B-Line Systems, Inc.; a division of Cooper Industries.
  3. Carpenter & Paterson, Inc.
  4. Empire Industries, Inc.
  5. Globe Pipe Hanger Products, Inc.
  6. Grinnell Corp.
  7. GS Metals Corp.
  8. National Pipe Hanger Corporation.
  9. PHD Manufacturing, Inc.
  10. Piping Technology & Products, Inc.
  11. Tolco Inc.
- C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

### 2.03 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

### 2.04 METAL FRAMING SYSTEMS

- A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.
- B. Manufacturers:
  1. B-Line Systems, Inc.; a division of Cooper Industries.

2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
  3. GS Metals Corp.
  4. Power-Strut Div.; Tyco International, Ltd.
  5. Thomas & Betts Corporation.
  6. Tolco Inc.
  7. Unistrut Corp.; Tyco International, Ltd.
- C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

#### 2.05 THERMAL-HANGER SHIELD INSERTS

- A. Description: 100-psig- (690-kPa-) minimum, compressive-strength insulation insert encased in sheet metal shield.
- B. Manufacturers:
1. Carpenter & Paterson, Inc.
  2. ERICO/Michigan Hanger Co.
  3. PHS Industries, Inc.
  4. Pipe Shields, Inc.
  5. Rilco Manufacturing Company, Inc.
  6. Value Engineered Products, Inc.
- C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier.
- D. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass.
- E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- G. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

#### 2.06 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
1. Manufacturers:
- a. Hilti, Inc.
  - b. ITW Ramset/Red Head.
  - c. Masterset Fastening Systems, Inc.
  - d. MKT Fastening, LLC.
  - e. Powers Fasteners.
- B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
1. Manufacturers:
- a. B-Line Systems, Inc.; a division of Cooper Industries.
  - b. Empire Industries, Inc.
  - c. Hilti, Inc.



- d. ITW Ramset/Red Head.
- e. MKT Fastening, LLC.
- f. Powers Fasteners.

## 2.07 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

## 2.08 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
  - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
  - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

## PART 3 - EXECUTION

### 3.01 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
  - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F (49 to 232 deg C) pipes, NPS 4 to NPS 16 (DN 100 to DN 400), requiring up to 4 inches (100 mm) of insulation.
  - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN 20 to DN 600), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
  - 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24 (DN 15 to DN 600), if little or no insulation is required.
  - 5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
  - 6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8 (DN 20 to DN 200).

7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
  8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
  9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2 (DN 15 to DN 50).
  10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8 (DN 10 to DN 200).
  11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3 (DN 10 to DN 80).
  12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
  13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
  14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange.
  15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
  16. Adjustable, Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36 (DN 65 to DN 900), if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
  17. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30 (DN 25 to DN 750), from 2 rods if longitudinal movement caused by expansion and contraction might occur.
  18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20 (DN 65 to DN 500), from single rod if horizontal movement caused by expansion and contraction might occur.
  19. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42 (DN 50 to DN 1050), if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
  20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24 (DN 50 to DN 600), if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
  21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30 (DN 50 to DN 750), if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500).
  2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.
- H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.

2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
  3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
  4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
  5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.
- I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
  2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction to attach to top flange of structural shape.
  3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
  4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
  5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
  6. C-Clamps (MSS Type 23): For structural shapes.
  7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
  8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
  9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
  10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
  11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
  12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    - a. Light (MSS Type 31): 750 lb (340 kg).
    - b. Medium (MSS Type 32): 1500 lb (680 kg).
    - c. Heavy (MSS Type 33): 3000 lb (1360 kg).
  13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
  14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
  15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
  2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
  3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
  2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
  3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
  4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
  5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.
  6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
  7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.
  8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
    - a. Horizontal (MSS Type 54): Mounted horizontally.
    - b. Vertical (MSS Type 55): Mounted vertically.
    - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.
- N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

### 3.02 HANGER AND SUPPORT INSTALLATION

- A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
  1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
  2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

- E. Fastener System Installation:
  - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
  - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- K. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.
- M. Insulated Piping: Comply with the following:
  - 1. Attach clamps and spacers to piping.
    - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    - c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.
  - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
    - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
  - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
    - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
  - 4. Shield Dimensions for Pipe: Not less than the following:
    - a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.

- b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
  - c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
  - d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
  - e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.
5. Pipes NPS 8 (DN 200) and Larger: Include wood inserts.
  6. Insert Material: Length at least as long as protective shield.
  7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

### 3.03 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make smooth bearing surface.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

### 3.04 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

### 3.05 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

### 3.06 PAINTING

- A. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.

- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

## SECTION 23 05 48

### Mechanical Vibration Isolation and Seismic Restraint Systems

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.02 SUMMARY

- A. It is the objective of this Specification to provide the necessary design requirements for the control of excessive noise and vibration in the buildings due to the operation of machinery or equipment, and/or due to interconnected piping, ductwork or conduit. It is also the objective of this specification to provide the design criteria for seismic restraints for all isolated and non-isolated equipment.
- B. Work in this section includes the providing of labor, materials, equipment and services necessary for a complete and safe installation in of vibration isolation systems and seismic restraints for every mechanical system including piping and ductwork within and on the roof of the building, complete, as shown and specified per the contract documents and all applicable codes and authorities having jurisdiction.
- C. The work of this section includes, but is not limited to the following:
  - 1. Vibration isolation elements for piping and equipment.
  - 2. Equipment isolation bases.
  - 3. Piping flexible connections.
  - 4. Seismic restraints for isolated and non-isolated piping, tanks, stacks, ductwork, VAV boxes, and equipment.
- D. Related Sections:
  - 1. All Division 23000 Sections as issued for this project.
- E. Seismic restraints:



1. All equipment, piping and ductwork shall be adequately restrained to resist seismic forces. This specification is in addition to the specified vibration isolation for this project. Restraint devices shall be designed and selected to meet seismic requirements as defined in the latest issue of the state and local codes and other authorities having jurisdiction.
  2. Anchor bolt calculations, signed and stamped by a registered Professional Engineer, shall be submitted showing adequacy of the bolt sizing and type. Calculations shall include anchor embedment, minimum edge distance and minimum center distance. The design lateral forces shall be distributed in proportion to the mass distribution of the equipment. Calculations shall be furnished for anchors on restraint devices, cables, isolators and on rigid mounted equipment. The seismic designer must perform final jobsite inspection to verify anchor installation.
  3. Contractor shall supply all supplemental steel required for all equipment, ductwork and piping including roof mounted equipment.
  4. All isolators and equipment shall meet OSHPD requirements and contain approval from OSHPD.
- F. This specification shall be supplemented by all local codes and ordinance which shall take precedence in the event of the existence of any conflict between same and this specification. Where methods or materials specified are equivalent to the code requirements specified, comply with the specified requirements.
- G. Seismic-Restraint Loading:
1. Site Class as Defined in the IBC: D
  2. Assigned Seismic Use Group or Building Design Category as Defined in the IBC:  
C
    - a. Component Importance Factor: 1.50
    - b. Component Response Modification Factor: 6.0
    - c. Component Amplification Factor: 2.5
  3. Design Spectral Response Acceleration at Short Periods (0.123 Second): 0.327
  4. Design Spectral Response Acceleration at 1-Second Period: 0.077

### 1.03 SUBMITTALS

A. In addition to the requirements of the section on Mechanical General Provisions, the submittal material shall include descriptive data for all products and materials including, but not limited to, the following:

1. Descriptive Data:

- a. Catalog cuts and data sheets on specific vibration isolators and seismic restraints to be utilized showing compliance with the specifications.
- b. An itemized list showing the items of equipment or piping to be isolated, the isolator type and model number selected, isolator loading and deflection, and reference to specific drawings showing seismic restraints, base and construction where applicable.
- c. An itemized list of non-isolated equipment, piping, and ductwork to be seismically restrained.
- d. Seismic restraint calculations.
- e. Riser supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes and seismic loads. Include certification that riser system has been examined for excessive stress and that none will exist.
- f. Structural or civil engineer's stamp verifying design and calculations for seismic restraining systems used.

2. Shop Drawings:

- a. Drawings showing equipment base constructions for each machine, including dimensions, structural member sizes and support point locations.
- b. Drawings showing methods of suspension, support guides for piping and ductwork.
- c. Drawings showing methods for isolation of pipes and ductwork piercing walls and slabs.
- d. Concrete and steel details for bases, including anchor bolt locations.
- e. Number and location of seismic restraints and anchors for each piece of equipment and of ductwork and piping.
- f. Specific details of restraints, including anchor bolts for mounting and maximum loading at each location for each piece of equipment and lengths of ductwork and piping.

#### 1.04 CODE AND REFERENCE STANDARD REQUIREMENTS

- A. All equipment supplied under this specification shall conform in all respects to the rules and regulations of:
  - 1. SMACNA "Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems." 1982
  - 2. 2003 ASHRAE GUIDE, Chapter 47, and Chapter 54
  - 3. All applicable state and local codes and authorities having jurisdiction.
  - 4. American Society for Testing and Materials:
    - a. ASTM A 36/a 36M-96: Specification for Carbon Structural Steel.
    - b. ASTM E 488-96: Test Methods for Strength of Anchors in Concrete and Masonry Elements.
  - 5. American Welding Society:
    - a. ASW D1.1-98: Structural Welding Code – Steel.

#### 1.05 QUALITY ASSURANCE

- A. All vibration isolation and seismic restraint devices shall be the product of a single manufacturer. Products of other manufacturer's are acceptable provided that their systems comply with the design intent for system performance, static deflection and structural design of the base manufacturer.
- B. Vibration isolation firms having a minimum ten years experience designing and supervising the installation of vibration isolation and seismic restraint systems shall be qualified to provide the materials and installation required by this section. Project listings shall be provided including geographical location and a reference contact.
- C. The installation of all vibration isolation units, and associated seismic restraints, hangers and bases, shall be under the direct supervision of the vibration isolation manufacturer's representative. The isolation manufacturer is to send a letter stating that they have inspected all of the vibration isolation units installed and they are installed properly and operating.
- D. Substitution of internally isolated mechanical equipment in lieu of the specified isolation of this Section must be approved for individual equipment units and is acceptable only

if above acceleration loads are certified in writing by the equipment manufacturer and stamped and sealed by a licensed civil or structural engineer.

- E. Purchased and/or fabricated equipment must be designed to safely accept external forces of 1.0 g load in any direction for all rigidly and resiliently supported equipment, piping and ductwork without failure and permanent displacement of the equipment. Life safety equipment such as fire pumps, smoke exhaust fans, emergency generators and other life safety designated equipment must be capable of accepting external forces of up to 1.5 g in any direction without permanent displacement or failure of the equipment.
- F. Standards: If any item in this specification as furnished by the contractor is manufactured in a location which does not certify the referenced standards as defined in paragraph 1.4 of this specification, the contractor is to pay the owner for all expenses incurred by the owner for an outside testing company to confirm such compliances.
- G. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver each item as a factory-assembled unit with protective crating and covering.
- B. Store in a dry location.
- C. Provide disassembly and re-assembly as required to accommodate rigging and shipping.
- D. Comply with the manufacturer's written rigging and installation instructions for unloading, transporting and setting in final location.
- E. All equipment with shaft bearings (pump, fans, etc..) must have the shaft rotated every 2 weeks and the equipment must be stored inside.

#### 1.07 SUBSTITUTIONS

- A. Any proposed substitution must be submitted at the time the bid is submitted. No substitute material or manufacturer of equipment shall be permitted without a formal written submittal to the engineer which includes all dimensional, performance and

material specifications and is approved in writing by the engineer. Any changes in layout or design brought about by the use of a substitution shall be submitted to the engineer fully designed for review in conjunction with the submittal of the alternate. Any substitutions must be submitted with an explanation why a substitution is being proposed. If the substitute is being proposed for financial reasons the associated credit must be simultaneously submitted.

- B. Final acceptance or rejection of any substitution is subject to the Owner's review.

#### 1.08 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into base. Coordinate with the architect and structural engineer for concrete, reinforcement, and formwork requirements.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. The following are approved manufacturers, provided their systems strictly comply with the design intent for performance, deflection and structural capacity of this specification.
  1. Mason Industries, Inc., Hauppauge, NY
  2. Vibration Mountings & Controls, Inc., Bloomingdale, NJ
  3. Kinetics Noise Control, Dublin, OH
  4. Vibration Eliminator Co., Inc., Capiague, NY
  5. Amber Booth, Houston, TX

#### 2.02 DESCRIPTION

- A. All vibration isolators shall have either known undeflected heights or calibration markings so that, after adjustment, when carrying their load, the deflection under load can be verified, thus determining that the load is within the proper range of the device

and that the correct degree of vibration isolation is being provided according to the design.

- B. All isolators shall operate in the linear portion of their load versus deflection curve. Load versus deflection curves shall be furnished by the manufacturer, and must be linear over a deflection range of not less than 50% above the design deflection.
- C. Where spring isolation systems are described in the following specifications, the mounting assemblies shall utilize bare springs with the spring diameter not less than 0.8 of the loaded operating height of the spring. Each spring isolator shall be designed and installed so that the ends of the springs remain parallel. The minimum deflection from loaded operating height to spring solid height shall be 50% of the rated static deflection of the spring.
- D. Where neoprene-in-shear isolation systems are described in the following specifications, the mounting assemblies shall utilize bare neoprene elements with unit type design molded in oil resistant neoprene. The neoprene shall be compounded to meet the following:
  - 1. Shore hardness of 35 to 65  $\pm$ 5, after minimum aging of 20 days or corresponding oven-aging.
  - 2. Minimum tensile strength of 2000 PSI.
  - 3. Minimum elongation of 300 %.
  - 4. Maximum compression at 25 % of original deflection.
- E. The isolator ratio of lateral to vertical stiffness shall not be less than 0.9 nor more than 1.5.
- F. The theoretical vertical natural frequency for each support point, based upon load per isolator and isolator stiffness, shall not differ from the design objectives for the equipment as a whole by more than  $\pm$ 10%.
- G. All mounting systems, including seismic restraints, exposed to weather and other corrosive environments shall be protected with factory corrosion resistance. All metal parts of mountings (except springs and hardware) to be hot dip galvanized. Springs shall be powder coated and neoprene coated. Nuts and bolts shall be cadmium plated.

- H. All roof-mounted isolators shall be bolted or welded to building steel and anchored to the structure to resist 110 mph wind loads.

## 2.03 MANUFACTURER RESPONSIBILITIES

- A. Manufacturer of vibration isolation and seismic restraint equipment shall have the following responsibilities:
  1. Determine vibration isolation and seismic restraint sizes and locations.
  2. Provide piping and equipment isolation systems and seismic restraints as scheduled or specified.
  3. Guarantee specified isolation system deflection.
  4. Provide installation instructions, drawings and field supervision to assure proper installation and performance.

## 2.04 VIBRATION ISOLATORS

- A. Type A: Bare spring isolators shall incorporate the following:
  1. Minimum 1/4" (6 mm) thick neoprene acoustical base pad on underside, unless designated otherwise.
  2. Non-resonant with equipment forcing frequencies or support structure natural frequencies.
  3. Requires seismic restraint type II
  4. Spring isolators to be Mason Type SLF, or as approved.
  
- B. Type B: Spring isolators shall be same as Type A, except:
  1. Provide built-in vertical limit stops with minimum 1/4" clearance under normal operation.
  2. Tapped holes in top plate for bolting to equipment. All hot dipped galvanized for outdoor installation such as at the air cooled chiller and centrifugal exhaust fans.
  3. Capable of supporting equipment at a fixed elevation during equipment erection. Installed and operating heights shall be identical.

4. Shall incorporate snubbing restraint in all directions. Cast or aluminum housings are unacceptable. System to be field bolted or welded to deck with ability to resist forces of 1.5 g acceleration.
5. Mason Type SLR, or as approved.

C. Type C: Spring hanger rod isolators shall incorporate the following:

1. Spring element seated on a steel washer within a neoprene cup incorporating a rod isolation bushing.
2. Steel retainer box encasing the spring and neoprene cup.
3. Provide sufficient clearance between retainer box and spring hanger rod to permit minimum 15 degree allowable rod misalignment in any direction, total 30 degrees.
4. Requires seismic restraint type III
5. Mason Type TPC-30N, or as approved.
6. Where operating weight differs from installed weight, provide built-in adjustable limit stops to prevent equipment rising when weight is removed. Stops shall not be in contact during normal operation.

D. Type D: Elastomer Mounting Types/Elastomer Isolators, shall incorporate the following:

1. Bolt holes for bolting to equipment base.
2. Bottom steel plates for bolting or welding to sub-base as required.
3. Unit type design molded in oil-resistant neoprene.
4. Encased in ductile steel or iron casing and capable of withstanding external forces of up to 1.5 g. System to be field bolted or welded to deck with ability to resist forces of 1.5 g.
5. Mason Type ND isolation BR, RBA or as approved.

E. Type E: Elastomer hanger rod isolators 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. Clearance between mounting hanger rod and neoprene bushing shall be minimum 1/8".
  5. Requires seismic restraint type III.
  6. Mason Type HD, or as approved.
- F. Type F: Combination spring/elastomer hanger rod isolators to incorporate the following:
1. Spring and neoprene isolator elements in a steel box retainer.
  2. Other characteristics of steel box retainer and hanger rod swing as described for Type C isolators.
  3. Requires seismic restraint type III
  4. Mason Type TPC-30N, or as approved.
- G. Type G: Pad type elastomer mountings to incorporate the following:
1. 0.750" minimum thickness.
  2. 50 psi maximum loading.
  3. Ribbed or waffled design.
  4. 0.10" deflection per pad thickness.
  5. 1/16" galvanized steel plate between multiple layers of pad thickness.
  6. Suitable bearing plate to distribute load.
  7. Requires seismic restraint type II or III as installation requires.
  8. Mason Type Super W, or as approved.
- H. Type H: Pad type elastomer mountings to incorporate the following:
1. Laminated canvas duck and neoprene.
  2. Maximum loading 1000 psi.

3. Suitable bearing plate to distribute load.
  4. Minimum thickness, 2".
  5. Requires seismic restraint type II or III as installation requires.
  6. Mason Type HL, or as approved.
- I. Type I: Air Mounts: Freestanding, single or multiple, compressed-air bellows.
1. Assembly: Upper and lower steel sections connected by a replaceable, flexible, nylon-reinforced neoprene bellows.
  2. Maximum Natural Frequency: 3 Hz.
  3. Operating Pressure Range: 25 to 100 psig.
  4. Burst Pressure: At least three times the manufacturer's published maximum operating pressure.
  5. Leveling Valves: Minimum of 3 required to maintain leveling within plus or minus 1/8 inch.
  6. Requires seismic restraint type II
- J. Restrained Air Mounts: Housed compressed-air bellows.
1. Assembly: Upper and lower steel sections connected by a replaceable, flexible, nylon-reinforced neoprene bellows and spring, with angle-iron frame having vertical-limit stops and channel-section top with leveling adjustment and attachment screws.
  2. Maximum Natural Frequency: 3 Hz.
  3. Operating Pressure Range: 25 to 100 psig.
  4. Burst Pressure: At least three times the manufacturer's published maximum operating pressure.
  5. Leveling Valves: Minimum of 3 required to maintain leveling within plus or minus 1/8 inch.
  6. Requires seismic restraint type II

## 2.05 EQUIPMENT BASES

A. Integral Structural Steel Base, Type B-1

1. Reinforced, as required, to prevent base flexure at start-up and misalignment of drive and driven units. Centrifugal fan bases complete with motor slide base with double adjustment bolts.. Drilled for drive and driven unit mounting template.
2. Mason Type M, WF, or as approved.

B. Concrete Inertia Base, Type B-2

1. Concrete inertia bases shall be formed in a structural steel perimeter base, reinforced as required to prevent flexure, misalignment of drive and driven unit or stress transfer into equipment. The base shall be complete with motor slide base with double adjustment bolts , pump base elbow supports, and complete with height saving brackets, reinforcing, equipment bolting provisions and isolators.
2. Minimum thickness of the inertia base shall be according to the following tabulation:

Motor Size		Minimum Thickness	
(hp)	(kw)	(in.)	(mm)
5-15	(4-11)	6	(150)
20-50	(15-37)	8	(200)
60-75	(45-55)	10	(250)
100-250	(75-190)	12	(300)
300-500	(220-375)	18	(350)

3. Mason Type K, BMK, or as approved.

C. Curb Mounted Base, Type B-3

1. Rooftop equipment, such as the air cooled chiller, shall be mounted on steel dunnage that is part of the structure and roof construction and are flashed and incorporated into roof's membrane waterproofing system.
2. All spring isolators shall have Type G continuous Super W elastomer mounting pads between the equipment and the isolator plate and bolted through.
3. Curb and equipment shall be capable of withstanding 110mph wind and 1.5 g seismic loads.

D. Type B-4 (Flashable Roof Rail System)

1. Rooftop fans, condensing units, air handlers, etc. shall be mounted on continuous support piers that combines equipment support and isolation into (1) assembly.
2. Rails shall incorporate Type A isolators which are adjustable, removable and interchangeable after equipment has been installed.
3. The system shall maintain the same installed and operating height with or without the equipment load.
4. The system shall have full plywood nailers on all (4) sides, designed to accept membrane waterproofing and shall be dry galvanized or plastic coated.
5. Unit to be supplied with flashing.
6. Roof rail shall be similar to Mason Industries Type R-7000 having a minimum 3" rated static deflection.

E. Type B-6 (Non-Isolated Roof Curb)

1. Non-isolated, curb mounted rooftop equipment shall be mounted on structural curbs that meet the acceleration criteria hereinbefore defined.
2. Curbs shall accept standard 2" roof insulation furnished and installed by the roofing contractor.
3. Non-isolated curbs shall be similar to Mason Industries Type B-6000.

## 2.06 FLEXIBLE CONNECTORS

A. Elastomer Type FC-1

1. Manufactured of nylon tire cord and EPDM, both molded and cured with hydraulic presses.
2. Straight connectors to have two spheres reinforced with a molded-in external ductile iron ring between spheres.
3. Elbow shall be long radius reducing type.
4. Rated 250 psi. at 170°F. Dropping in a straight line to 170 psi. at 250°F for sizes 1-1/2" to 12", elbows. Elbows shall be rated no less than 90% of straight connections.
5. Sizes 10" and 12" to employ control cables with neoprene end fittings isolated from anchor plates by means of 2" bridge bearing neoprene bushings.

6. Minimum safety factor of 4 to 1 at maximum pressure ratings.
7. Submittals to include test reports, projected life, replacement interval, compression and elongation limits.
8. Mason Types SuperFlex MFNEC, MFLRR, MFTFU, MFTNC, MFTCR, or as approved.

B. Flexible Stainless Hose, Type FC-2

1. Braided flexible metal hose.
2. 2" pipe size and smaller with male nipple fittings.
3. 2-1/2" and larger pipe size with fixed steel flanges.
4. Suitable for operating pressure with 4 to 1 minimum safety factor.
5. Length as shown on drawings.
6. Mason Type BSS, or as approved.

C. Unbraided Exhaust Hose, Type FC-3

1. Low pressure stainless steel angularly corrugated.
2. Fitted with flanged ends.
3. Maximum temperature 1500°F.
4. Mason Type SDL-RF, or as approved.

## 2.07 SEISMIC RESTRAINTS

- A. All seismic restraints for mechanical equipment shall be capable of safely accepting 1.0 g (1.5 g for designated life safety equipment) external forces without failure, and shall maintain equipment, piping, duct and pressure reducing boxes in a captive position. Seismic restraints shall not short circuit isolation systems or transmit objectionable vibration or noise, and shall be Provided on all equipment as scheduled on drawings.
- B. Submit calculations by a licensed Structural or Civil Engineer substantiating that all equipment mountings and foundations and their seismic restraints can safely accept external forces of 1.0 g load for all rigidly and resiliently supported equipment, piping, and ductwork (1.5 g load for all life safety equipment) without failure and permanent

displacement. Restrain all resiliently mounted piping and ductwork with cable sway bracing by Mason Industries, or approved equal.

### C. Seismic Restraint Types

#### 1. Seismic Restraint, Type I

- a. Shall comply with general characteristics of spring isolators.
- b. Shall have vertical restraints and are capable of supporting equipment at fixed elevation during equipment erection.
- c. Shall incorporate seismic snubbing restraint in all directions at specified acceleration loadings.
- d. System to be field bolted to structure with minimum capability to withstand external forces of 1.5 g.
- e. Mason Type SSLR, or as approved.

#### 2. Seismic Restraint, Type II

- a. Each corner or side seismic restraint shall incorporate minimum 5/8" thick pad limit stops. Restraints shall be made of plate, structural members or square metal tubing in a welded assembly, incorporating resilient pads. Angle bumpers are not acceptable. System to be field bolted to deck with 1.5 g acceleration capacity.
- b. Seismic spring mountings as described above are an acceptable alternative providing all seismic loading requirements are met.
- c. Mason Industries Type Z-1011, Type Z-1225, or as approved.

#### 3. Seismic Restraint, Type III

- a. Galvanized steel aircraft cables with end connections made of steel assemblies that swivel to final installation angle and utilize two clamping bolts for cable fastening to equipment and structure. System to be field bolted to deck or overhead structural members or deck with aircraft cable and clamps as per SMACNA guidelines.

## PART 3 - EXECUTION

### 3.01 GENERAL VIBRATION ISOLATION REQUIREMENTS

- A. Install in accordance with manufacturer's written instructions. Vibration isolators must not cause any change of position of equipment or piping resulting in piping stresses or misalignment.
- B. Mechanical equipment shall be isolated from the building structure by means of noise and vibration isolators as scheduled on the drawings or within these specifications.
- C. No rigid connections between equipment and building structure shall be made that degrades the noise and vibration isolation systems herein specified.
- D. Electrical circuit connections to isolated equipment shall be looped to allow free motion of isolated equipment.
- E. The contractor shall not install any equipment, piping or conduit which makes rigid contact with the "building" unless permitted in this Specification. Building includes, but is not limited to, slabs, beams, columns, studs and walls.
- F. Isolation mounting deflection shall be (minimum) as specified or scheduled on drawings.
- G. Coordinate work with other trades to avoid rigid contact with the building. Inform other trades following work, such as plastering or electrical, to avoid any contact which would reduce the vibration isolation.
- H. Bring to the Architect's attention, prior to installation, any conflicts with other trades which will result in unavoidable rigid contact with equipment or piping as described herein, due to inadequate space or other unforeseen conditions. Corrective work necessitated by conflicts after installation shall be at the responsible contractor's expense.
- I. Bring to the Architect's attention any discrepancies between the specifications and field conditions or changes required due to specific equipment selection, prior to installation. Corrective work necessitated by discrepancies after installation shall be at the contractor's expense.
- J. Obtain inspection and approval of any installation to be covered or enclosed, prior to such closure.

- K. Correct, at no additional cost, all installations which are deemed defective in workmanship or materials.

### 3.02 EQUIPMENT ISOLATION

- A. Mount floor mounted equipment on 4" high concrete housekeeping pads over complete floor area of equipment. Mount vibration isolating devices and related inertia blocks on concrete pad. Key housekeeping pads with hair pins, as required, to be integral with structural slab. Provide approved seismic restraint anchor plates flush with top of housekeeping pad. Concrete work specified in Division 3.

### 3.03 EQUIPMENT BASES

- A. Fill concrete inertia bases, after installing base frame, with concrete; trowel to a smooth finish.
- B. Concrete Bases: Anchor equipment to concrete base according to supported equipment manufacturer's written instructions for seismic codes at Project site.
  - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch(450-mm) centers around the full perimeter of the base.
  - 2. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base and anchor into structural concrete floor.
  - 3. Place and secure anchorage devices. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 5. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
  - 6. Cast-in-place concrete materials and placement requirements are specified in Division 3.
- C. Each fan and motor assembly shall be supported on a single structural steel frame. Flexible duct connections shall be provided at inlet and discharge of fan.
- D. The machine to be isolated shall be supported by a structural steel frame or concrete inertia base.



- E. Brackets shall be provided to accommodate the isolator. The vertical position and size of the bracket shall be specified by the isolator manufacturer.
- F. The minimum operating clearance between the equipment frame or rigid steel base frame and the housekeeping pad or floor shall be 1". Minimum operating clearance between concrete inertia and base and housekeeping pad or floor shall be 2".
- G. The equipment structural steel or concrete inertia base shall be placed in position and supported temporarily by blocks or shims, as appropriate, prior to the installation of the machine or isolators.
- H. The isolators shall be installed without raising the machine and frame assembly.
- I. After the entire installation is complete and under full operational load, the isolators shall be adjusted so that the load is transferred from the blocks to the isolators. When all isolators are properly adjusted, the blocks or shims shall be barely free and shall be removed.
- J. Prior to start-up, clean out all foreign matter between bases and equipment. Verify that there are no isolation short circuits in the base, isolators or seismic restraints.
- K. Verify that all installed isolator and mounting systems permit equipment motion in all directions. Adjust or provide additional resilient restraints to flexibly limit start-up equipment lateral motion to 1/4".
- L. Provide flexible connections between all fans and ductwork. Refer to duct accessories section.
- M. When operating weight differs from installed weight, provide built-in limit stops to prevent equipment from rising when weight is removed. Stops shall not be in contact during normal operation.
- N. Additional Requirements
  - 1. Diagonal thrust restraint shall be as described for Type C hanger with the same deflection as specified for the spring mountings. The spring element shall be designed so it can be pre-set for thrust and adjusted to allow for a maximum of 1/4" movement at start and stop. Thrust restraints shall be attached at the centerline of thrust. Restraint shall be Mason Type WB, or as approved.

2. All piping and ductwork to be isolated shall freely pass through walls and floors without rigid connections. Penetration points shall be sleeved or otherwise formed to allow passage of piping or ductwork, and maintain 3/4" to 1 1/4" clearance around the outside surfaces. This clearance space shall be tightly packed with fiberglass (except in cases of fire smoke dampers in ducts), and caulked airtight after installation of piping or ductwork.
3. HVAC piping vertical risers larger than 2" in diameter shall be isolated from the building structure by means of noise and vibration isolation guides and supports.
4. Isolators shall be installed with the isolator hanger box attached to, or hung as close as possible to, the structure. Hanger rods shall be aligned to clear the hanger box.
5. Isolators shall be suspended from substantial structural members, not from slab diaphragm unless specifically permitted.
6. Structural steel for cooling tower or other equipment must support the equipment without excessive deflection of the steel. The structural steel support shall not be resonant with the isolation system resonant frequencies or the driving frequencies of the supported equipment.

#### 3.04 PIPING AND BOILER BREECHING ISOLATORS

- A. All piping and boiler breeching, except fire standpipe systems, are included under this Section.
- B. Installation:
  1. Isolate piping, generator stacks/breeching, muffler, domestic hot water breeching and boiler breeching outside of shafts as follows:
    - a. All water, steam and glycol piping and breeching in the boiler room and machine rooms.
    - b. Piping where exposed on roof.
    - c. Water piping, stacks, all mufflers and all boiler breeching within 50 ft, or 100 diameters, which ever is greater, from connected equipment.
    - d. All other piping shall be rigidly supported and provided with approved seismic restraints to maintain the piping in a captive position without excessive motion.
    - e. Do not use neoprene components on emergency generator exhaust.

- f. All emergency generator fuel oil piping and pumps.
2. All piping 2" and over located in mechanical equipment rooms, and for a minimum of fifty (50) feet or 100 pipe diameters, whichever is greater, from connection to vibrating mechanical or electrical equipment, shall be isolated from the building structure by means of noise and vibration isolation hangers, Type F.
3. Horizontal suspended pipe 2" and smaller and all steam piping shall be suspended by Type E isolator with a minimum 3/8" deflection. Water pipe larger than 2" shall be supported by Type F isolator with a minimum 1", or same static deflection as isolated equipment to which pipe connects, whichever is greater.
4. Horizontal pipe floor supported at slab shall be supported via Type B, with a minimum static deflection of 1" or same deflection as isolated equipment to which pipe connects, whichever is the greater.
5. Vertical riser pipe supports shall utilize Type H.
6. Vertical riser guides, if required, shall avoid direct contact of piping with building.
7. Pipe anchors, where required, shall utilize resilient pipe anchors, Mason Industries Type ADA, or equivalent, to avoid direct contact of piping with building.
8. Pipe sway braces, where required, shall utilize two (2) neoprene elements (Type G or H to accommodate tension and compression forces).
9. Pipe extension and alignment connectors: Provide connectors at riser takeoffs, cooling and heating coils, and elsewhere as required, to accommodate thermal expansion and misalignment.
10. Adjust, as required, all isolators to eliminate all contact of the isolated rod with the hanger rod box retainer or short circuiting of the spring.

C. Domestic Water System Isolation :

1. Support all domestic water piping in horizontal and vertical runs with a resilient wrapping or clamp system employing a resilient element of wool, felt, neoprene, or other suitable material; "Trisolators" by Semco or P.R. Isolators by Potter-Roemer, or as approved.
2. All domestic water piping, size 2" and larger within the building shall be isolated as follows:
  - a. Provide Type F hanger rod isolators with a minimum static deflection of 1" (25 mm) or as scheduled.
  - b. Provide Type B isolators with 1" static deflection, or as scheduled.

- c. Support water piping in shafts and floor supports` entering shaft with Type G isolators or Type H pad to prevent direct contact of piping with building structure.
  - d. Guide and anchor piping in shafts, as required, with approved mounting designs incorporating Type H pad to prevent direct contact of pipe with building structure.
- D. Isolator Position:
- 1. Close to building structure.
  - 2. Between building structure and supplementary steel if required.
  - 3. Suspend isolators from rigid and massive support points.
  - 4. All supplementary steel to be sized for a maximum deflection of 0.08 inches (2 mm) at center span.

### 3.05 GENERAL SEISMIC RESTRAINT REQUIREMENT

- A. All equipment whether isolated or not shall be bolted to structure to allow for minimum 1.0 g of acceleration (1.5 g for life safety equipment). Bolt points and diameter of inserts shall be submitted and verified as part of the contractor's submission for each piece of equipment and stamped and sealed by a civil or structural engineer.
- B. Position all corner or side seismic restraints with equipment at operating weight for proper operation clearance and weld or bolt seismic restraint to seismic anchor plates in housekeeping pad. Install equipment with flexibility in wiring connection. Verify all installed isolators and mounting systems permit equipment motion in all directions. Adjust or provide additional resilient restraints to flexibly limit startup equipment lateral motion to 1/4 inch. Prior to startup, clean out all foreign matter between bases and equipment. Verify that there are no isolation short circuits in the base, isolators or seismic restraints.
- C. All suspended equipment, whether isolated or not, shall be seismically restrained at four points with Type III cable restraints.
- D. Install seismic restraining system Type III taut for overhead suspended unisolated equipment, piping or ductwork, and slack with 2" cable deflection for isolated systems.

- E. Seismically restrain all piping and ductwork with center bracing or Type III restraining system in accordance with SMACNA guidelines to comply as outlined below:
1. All schedule 10, 20, or 40 piping shall be welded or laterally braced at 40 foot intervals and at turns of more than 4 feet. Longitudinally bracing shall be supplied at 80 foot intervals. No-hub piping shall be braced at 10 foot intervals or at 40 foot intervals if 1.5 g rated couplings are used.
  2. Ductwork to be braced every 30 feet and at every turn and duct run ends. Longitudinal bracing to be provided at 60 foot intervals.
- F. Seismic restraints are not required for the following:
1. Gas piping less than 1" internal diameter.
  2. Piping in boiler and MER room that is less than 1 1/4" internal diameter. Less than 1 inch for fuel oil piping.
  3. All other piping and electrical conduit less than 2" internal diameter.
  4. All rectangular ducts less than 6 sq. ft. (0.56 m<sup>2</sup>) in cross sectional area.
  5. All round ducts less than 28" in diameter.
  6. All piping suspended by individual hangers 12" in length or less from the top of the pipe to the bottom of the support for the hanger.
  7. All ducts suspended by hangers 12" (305 mm) or less in length from the point of the attachment to the duct to the bottom of the support for the hanger.
- G. Chimneys, breeching and stacks passing through floors are to be bolted at each floor level or secured above and below each floor with riser clamps or approved vibration isolation systems with seismic restraints.
- H. Chimneys and stacks running horizontally to be braced every 30 ft with Type III restraining system.
- I. Where base anchoring is insufficient to resist seismic forces, supplementary restraining such as seismic restraint system Type III shall be used above system's center of gravity to suitably resist "g" force levels. Vertically mounted tanks may require this additional restraint.

- J. For overhead supported equipment, overstress of the building structure must not occur. Bracing may occur from:
1. upper flanges of structural beams;
  2. upper truss chords in bar joist construction at the panel points;
  3. cast-in-place inserts or drilled and shielded inserts in concrete structures suitably located away from edges.
- K. Each seismic restraint and snubbing device shall be installed after equipment is installed and fully operational. Each isolation mounting incorporating seismic restraint shall be adjusted to provide the minimum operating clearance in all directions to permit the operation of the equipment without objectionable noise or vibration to any part of the building structure. The operating clearance for equipment seismic restraints shall not be greater than 1/4" (6 mm). Seismic restraints must not result in short-circuiting of isolated equipment.
- L. Pipe risers through cored holes in structure require no additional seismic bracing. (Cored hole diameter to be a maximum of 2 inches larger than pipe outer diameter).

### 3.06 INSPECTION

- A. On completion of installation of all vibration isolation and seismic restraint devices herein specified, the local representative of the isolation materials manufacturer shall inspect the completed system and report in writing any installation errors, improperly selected isolation or restraint devices, or other faults that could affect the performance of the system. Contractor shall submit a report to the Architect, including the manufacturer's representatives final report, indicating all isolation reported as properly installed or requiring correction, and include a report by the Contractor on steps taken to properly complete the isolation work.

### 3.07 VIBRATION TESTING

- A. Owner reserves the right to require vibration testing for all new rotating pieces of equipment installed under this contract including pumps and fans. Vibration testing will be performed after the equipment is installed, aligned, dynamically balanced and commissioned. The mechanical contractor shall correct any deficiencies found with the new equipment as identified in the vibration analysis report. The vibration testing shall be as follows:
1. Equipment Vibration testing shall be performed by a certified vibration consultant. A report shall be provided indicating all of the pieces of equipment tested, the results of the tests and any deficiencies found.

2. Vibration allowances shall be as per the latest ASHRAE standard for rotating equipment (ASHRAE 2000 Systems and Equipment), as defined here:
3. Vibration shall not exceed 0.20 inches per second (0.20 in/sec), peak value throughout the operating range of the piece of rotating equipment. (If connected to a VFD.)
4. Measurements for all equipment, at each point shall be taken at each axis (3 axis) throughout the entire operating range of the equipment. (If connected to a VFD.)
5. The test for equipment connected and driven by a Variable Frequency Drive shall include natural (critical) speed testing. Measurements shall be taken throughout the operating range of the equipment starting from a complete stop, ramping slowly up to maximum speed, and pausing briefly at the natural frequencies of the equipment/VFD (15, 30, 45 and 60 Hz) during the test.
6. Tests for any piece of equipment not driven by a VFD shall be at their normal operating speed, under normal operating conditions.

### 3.08 CLEANING

- A. After completing equipment installation, inspect vibration isolation and seismic-control devices. Remove paint splatters and other spots, dirt, and debris.

### 3.09 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-mounting systems. Refer to Division 23 Section HVAC General Provisions or to Division 1 Section "Closeout Procedures and Demonstration and Training."

B.

C.

### 3.10 VIBRATION ISOLATION SCHEDULE

Equipment Type	Horsepower and Other	RPM	Base Type	Isolator Type	Min. Defl., in.
Chillers			–	B	
Rotary, screw	All	All	–	B	1.50
Air Compressors and vacuum pumping					

Tank-mounted horizontal	Up to 10	All	–	A or C	1.50
	15 & up	All	B-2	A or C	1.50
Tank-mounted vertical	All	All	B-2	A or C	1.50
Base-mounted	All	All	B-2	A or C	1.50
Large reciprocating Pumps	All	All	B-2	A or C	1.50
Close-coupled	Up to 7.5	All	B-2	A or C	.75
	10 & up	All	B-2	A or C	1.50
Large in-line	5 to 25	All	–	A or C	1.50
	30 & up	All	–	A or C	1.50
End suction and split case	Up to 40	All	B-2	A or C	1.50
	50 to 125	All	B-2	A or C	1.50
	150 & up	All	B-2	A or C	2.50
Boilers	All	All	B-1	B	1.50
Fans and Fan Sections					
Up to 22 in. diameter	All	All	-	A or C	.75
24 in. diameter	Up to 2 in. s.p.	Up to 300	B-2	A or C	3.50
		300 to 500	C	A or C	2.50
		501 & up	B	A or C	1.50
	2.1 in s.p and up	Up to 300	B-2	A or C	3.50
		300 to 500	C	A or C	2.50
		501 & up	B	A or C	1.50
Centrifugal Fans					
Up to 22 in. diameter	All	All	B-1	A or C	.75
24 in. diameter and up	Up to 40	Up to 300	B-1	A or C	3.50
		300 to 500	B-1	A or C	2.50
		501 & up	B-1	A or C	1.5
	50 and up	Up to 300	B-2	A or C	3.50
		300 to 500	B-2	A or C	2.50
Propeller Fans		501 & up	B-2	A or C	1.50
Wall-mounted	All	All	–	G	0.25



<b>Air Cooled Chillers</b>	<b>On Roof</b>	All	All	–	A	1.50
<b>Packaged AHU</b>						
All		Up to 10	All	–	A	1.0
		15 and up to 4 in. s.p.	Up to 300	–	A	3.50
			301 to 500	–	A	2.50
			501 & up	–	A	1.50
		15 and up, 4 in. s.p. & up	Up to 300	B-2	A	3.50
			301 to 500	B-2	A	2.50
			501 & up	B-2	A	1.50
<b>Packaged Rooftop Equipment</b>		All	All	B-3	G	2.50
<b>Ducted Rotating Equipment</b>						
Small fans, fan-powered boxes		Up to 600 cfm	All	–	A	0.50
		601 cfm & up	All	–	A	
<b>Curb-Mounted Equipment</b>		All	All	B-6	–	–
<b>Engine-Driven Generators &amp; Muffler</b>		All	All	–	A	2.50

1. Pumps mounted at grade do not require inertia bases. Provide Type A isolators.  
END OF SECTION

## SECTION 23 05 53

### Identification For HVAC Piping and Equipment

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 SUMMARY

- A. Section Includes:
  - 1. Equipment labels.
  - 2. Warning signs and labels.
  - 3. Pipe labels.
  - 4. Duct labels.
  - 5. Stencils.
  - 6. Valve tags.
  - 7. Warning tags.

##### 1.03 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

##### 1.04 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.
- D. Coordinate all unit numbering, designation and label locations with the owner.

## PART 2 - PRODUCTS

### 2.01 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
  - 1. Material and Thickness: Anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
  - 2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
  - 3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
  - 4. Fasteners: Stainless-steel rivets or self-tapping screws.
  - 5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include building identification, equipment's Drawing designation or unique equipment number, manufacturer's product name, model number and serial number, capacity, operating and power characteristics, essential data, and labels of tested compliances.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

### 2.02 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: Yellow.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 3 by 5 1/4".
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.
- J. Systems that shall include these labels shall include any exhaust system serving exhaust hoods, kitchen exhaust, radioactive exhaust, etc.

## 2.03 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
  - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
  - 2. Lettering Size: At least 1-1/2 inches high.

## 2.04 DUCT LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels with permanent adhesive.
- B. Letter Color: Black.
- C. Background Color: Refer to Part 3.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- G. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.
  - 1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions or as separate unit on each duct label to indicate flow direction.
  - 2. Lettering Size: At least 1-1/2 inches high.

## 2.05 STENCILS

- A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches for ducts; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.
  - 1. Stencil Material: Fiberboard or metal
  - 2. Stencil Paint: Exterior, gloss, alkyd enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
  - 3. Identification Paint: Exterior, alkyd enamel in colors according to ASME A13.1 unless otherwise indicated.

## 2.06 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
  2. Fasteners: Brass wire-link or beaded chain; or S-hook.
- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
1. Valve-tag schedule shall be included in operation and maintenance data.

## 2.07 WARNING TAGS

- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
1. Size: 3 by 5-1/4 inches minimum.
  2. Fasteners: Brass grommet and wire.
  3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
  4. Color: Yellow background with black lettering.

## PART 3 - EXECUTION

### 3.01 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

### 3.02 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

### 3.03 PIPE LABEL INSTALLATION

- A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
1. Near each valve and control device.
  2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
  3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
  4. At access doors, manholes, and similar access points that permit view of concealed piping.
  5. Near major equipment items and other points of origination and termination.
  6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
  7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

- B. Pipe Label Color Schedule:
  - 1. Chilled-Water Piping:
    - a. Background Color: Blue.
    - b. Letter Color: Black.
  - 2. Heating Water Piping:
    - a. Background Color: Red.
    - b. Letter Color: Black.

### 3.04 DUCT LABEL INSTALLATION

- A. Install plastic-laminated, self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:
  - 1. Blue: For cold-air supply ducts.
  - 2. Yellow: For hot-air supply ducts.
  - 3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
  - 4. ASME A13.1 Colors and Designs: For hazardous material exhaust.
- B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

### 3.05 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
  - 1. Valve-Tag Size and Shape:
    - a. Chilled Water: 1-1/2 inches.
    - b. Hot Water: 1-1/2 inches.
  - 2. Valve-Tag Color:
    - a. Chilled Water: Green.
    - b. Hot Water: Red.
  - 3. Letter Color:
    - a. Chilled Water: White.
    - b. Hot Water: White.

### 3.06 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

## SECTION 23 05 93

### Testing, Adjusting, and Balancing For HVAC

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 SUMMARY

- A. This Section includes TAB to produce design objectives for the following:
  - 1. Air Systems:
    - a. Constant-volume air systems.
    - b. Variable-air-volume systems.
    - c. Exhaust air system.
  - 2. HVAC equipment quantitative-performance settings.
  - 3. Exhaust airflow balancing.
  - 4. Space pressurization testing and adjusting.
  - 5. Vibration measuring.
  - 6. Sound level measuring.
  - 7. Indoor-air quality measuring
  - 8. Verifying that automatic control devices are functioning properly.
  - 9. Reporting results of activities and procedures specified in this Section.
  - 10. Commissioning.
- B. The TAB contractor shall submit all bids to the HVAC Contractor and to the Construction Manager and shall contract directly with the HVAC Contractor.

##### 1.03 DEFINITIONS

- A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.
- B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to indicated quantities.
- C. Barrier or Boundary: Construction, either vertical or horizontal, such as walls, floors, and ceilings that are designed and constructed to restrict the movement of airflow, smoke, odors, and other pollutants.
- D. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.
- E. NC: Noise criteria.
- F. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.
- G. RC: Room criteria.

- H. Report Forms: Test data sheets for recording test data in logical order.
- I. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.
- J. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.
- K. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
- L. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.
- M. TAB: Testing, adjusting, and balancing.
- N. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.
- O. Test: A procedure to determine quantitative performance of systems or equipment.
- P. Testing, Adjusting, and Balancing (TAB) Firm: The entity responsible for performing and reporting TAB procedures.

#### 1.04 SUBMITTALS

- A. Qualification Data: Within 15 days from Contractor's Notice to Proceed, submit 4 copies of evidence that TAB firm and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within 45 days from Contractor's Notice to Proceed, submit 4 copies of the Contract Documents review report as specified in Part 3.
- C. Strategies and Procedures Plan: Within 60 days from Contractor's Notice to Proceed, submit 4 copies of TAB strategies and step-by-step procedures as specified in Part 3 "Preparation" Article. Include a complete set of report forms intended for use on this Project.
- D. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.
- E. Sample Report Forms: Submit two sets of sample TAB report forms.
- F. Warranties specified in this Section.

#### 1.05 QUALITY ASSURANCE

- A. TAB Firm Qualifications: Engage a TAB firm certified by AABC or NEBB.
- B. TAB Conference: Meet with Owner's, Architect's and Commissioning Agent representatives on approval of TAB strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of TAB team members, equipment manufacturers' authorized service representatives, HVAC controls installers, and other support personnel. Provide seven days' advance notice of scheduled meeting time and location.
  - 1. Agenda Items: Include at least the following:



- a. Submittal distribution requirements.
  - b. The Contract Documents examination report.
  - c. TAB plan.
  - d. Work schedule and Project-site access requirements.
  - e. Coordination and cooperation of trades and subcontractors.
  - f. Coordination of documentation and communication flow.
- C. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:
- 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
  - 2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.
- D. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems." NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems." SMACNA's TABB "HVAC Systems - Testing, Adjusting, and Balancing." or TAB firm's forms approved by Architect.
- E. Instrumentation Type, Quantity, and Accuracy: As described in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems and NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."
- F. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.
- 1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.
- 1.06 COORDINATION
- A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.
  - B. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.
  - C. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

## PART 2 - PRODUCTS

(Not Applicable)

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

1. Contract Documents are defined in the General and Supplementary Conditions of Contract.
  2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- B. Examine approved submittal data of HVAC systems and equipment.
  - C. Examine Project Record Documents described in Division 01 Section "Project Record Documents."
  - D. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
  - E. Examine equipment performance data including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.
  - F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.
  - G. Examine system and equipment test reports.
  - H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.
  - I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
  - J. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
  - K. Examine terminal units, such as variable-air-volume boxes, to verify that they are accessible and their controls are connected and functioning.
  - L. Examine plenum ceilings used for return air to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.
  - M. Examine strainers for clean screens and proper perforations.
  - N. Examine valves (two-way and three-way) for proper installation for their intended function of diverting, varying or mixing fluid flows.

- O. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- P. Examine system pumps and piping to ensure absence of entrained air in the suction piping.
- Q. Examine all equipment for installation and for properly operating safety interlocks and controls including all boilers, chillers, air handling equipment, pumps, boxes and exhaust system equipment.
- R. Examine automatic temperature system components to verify the following:
  - 1. Dampers, valves, and other controlled devices are operated by the intended controller.
  - 2. Dampers and valves are in the position indicated by the controller.
  - 3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
  - 4. Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.
  - 5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
  - 6. Sensors are located to sense only the intended conditions.
  - 7. Sequence of operation for control modes is according to the Contract Documents.
  - 8. Controller set points are set at indicated values.
  - 9. Interlocked systems are operating.
  - 10. Changeover from heating to cooling mode occurs according to indicated values.
- S. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

### 3.02 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system readiness checks and prepare system readiness reports. Verify the following:
  - 1. Permanent electrical power wiring is complete.
  - 2. Hydronic systems are filled, clean, and free of air.
  - 3. Automatic temperature-control systems are operational.
  - 4. Equipment and duct access doors are securely closed.
  - 5. Balance, smoke, and fire dampers are open.
  - 6. Isolating and balancing valves are open and control valves are operational.
  - 7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
  - 8. Windows and doors can be closed so indicated conditions for system operations can be met.
- C. Coordinate all such checks with the owner's commissioning agent.

### 3.03 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems", NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems", SMACNA's TABB "HVAC Systems - Testing, Adjusting, and Balancing" and this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.
- C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

### 3.04 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct airflow measurements.
- E. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling unit components.
- L. Check for proper sealing of air duct system.
- M. When adjustable sheaves are provided with equipment for balancing, this contractor is to replace with fixed sheaves, after balancing is complete.

### 3.05 PROCEDURES FOR ALL AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
  - 1. Measure fan static pressures to determine actual static pressure as follows:

- a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
  - b. Measure static pressure directly at the fan outlet or through the flexible connection.
  - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
  - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
2. Measure static pressure across each component that makes up an air-handling unit, and other air-handling and treating equipment.
    - a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.
  3. Measure static pressures entering and leaving other devices such as exposed sound traps and other such equipment, under final balanced conditions. Measure duct riser pressure drops to assimilate the pressure drops of concealed (in shaft) sound attenuators.
  4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
  5. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
  6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.
  7. When balancing is complete, replace any adjustable sheaves to fixed sheaves.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
    - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
  2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
- C. Measure terminal outlets and inlets without making adjustments.
1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.
1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.

2. Adjust patterns of adjustable outlets for proper distribution without drafts.

### 3.06 PROCEDURES FOR INDOOR-AIR QUALITY MEASUREMENTS

- A. After air balancing is complete and with HVAC systems operating at indicated conditions, perform indoor-air quality testing.
- B. Observe and record the following conditions for each HVAC system:
  1. The distance between the outside-air intake and the closest exhaust fan discharge, flue termination, or vent termination.
  2. Specified filters are installed. Check for leakage around filters.
  3. Cooling coil drain pans have a positive slope to drain.
  4. Cooling coil condensate drain trap maintains an air seal.
  5. Evidence of water damage.
  6. Insulation in contact with the supply, return, and outside air is dry and clean.
- C. Measure and record indoor conditions served by each Air Handling Unit system. Make measurements at multiple locations served by the system if required to satisfy the following:
  1. Most remote area.
  2. One location per floor.
  3. One location for every 5000 sq. ft. (500 sq. m).
- D. Measure and record the following indoor conditions for each operating room two times at two-hour intervals, and in accordance with ASHRAE 113:
  1. Temperature.
  2. Relative humidity.
  3. Air velocity.
  4. Concentration of carbon dioxide (ppm).
  5. Concentration of carbon monoxide (ppm).
  6. Nitrogen oxides (ppm).
  7. Room Pressurization (in H<sub>2</sub>O).

### 3.07 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
  1. Manufacturer, model, and serial numbers.
  2. Motor horsepower rating.
  3. Motor rpm.
  4. Efficiency rating.
  5. Nameplate and measured voltage, each phase.
  6. Nameplate and measured amperage, each phase.
  7. Starter thermal-protection-element rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

### 3.08 PROCEDURES FOR HEAT-TRANSFER COILS

- A. Water Coils: Measure the following data for each coil:
  - 1. Entering- and leaving-water temperature.
  - 2. Water flow rate.
  - 3. Water pressure drop.
  - 4. Dry-bulb temperature of entering and leaving air.
  - 5. Wet-bulb temperature of entering and leaving air for cooling coils.
  - 6. Airflow.
  - 7. Air pressure drop.

### 3.09 PROCEDURES FOR TEMPERATURE MEASUREMENTS

- A. During TAB, report the need for adjustment in temperature regulation within the automatic temperature-control system.
- B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of two successive eight-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.
- C. Measure outside-air, wet- and dry-bulb temperatures.

### 3.10 PROCEDURES FOR VIBRATION MEASUREMENTS

- A. Use a vibration meter meeting the following criteria:
  - 1. Solid-state circuitry with a piezoelectric accelerometer.
  - 2. Velocity range of 0.1 to 10 inches per second.
  - 3. Displacement range of 1 to 100 mils.
  - 4. Frequency range of at least 0 to 1000 Hz.
  - 5. Capable of filtering unwanted frequencies.
- B. Calibrate the vibration meter before each day of testing.
  - 1. Use a calibrator provided with the vibration meter.
  - 2. Follow vibration meter and calibrator manufacturer's calibration procedures.
- C. Perform vibration measurements when other building and outdoor vibration sources are at a minimum level and will not influence measurements of equipment being tested.
  - 1. Turn off equipment in the building that might interfere with testing.
  - 2. Clear the space of people.
- D. Perform vibration measurements after air and water balancing and equipment testing is complete.
- E. Clean equipment surfaces in contact with the vibration transducer.
- F. Position the vibration transducer according to manufacturer's written instructions and to avoid interference with the operation of the equipment being tested.
- G. Measure and record vibration on rotating equipment over 3 hp.
- H. Measure and record equipment vibration, bearing vibration, equipment base vibration, and building structure vibration. Record velocity and displacement readings in the horizontal, vertical, and axial planes.
  - 1. Pumps:

- a. Pump Bearing: Drive end and opposite end.
- b. Motor Bearing: Drive end and opposite end.
- c. Pump Base: Top and side.
- d. Building: Floor.
- e. Piping: To and from the pump after flexible connections.
- 2. Fans and HVAC Equipment with Fans:
  - a. Fan Bearing: Drive end and opposite end.
  - b. Motor Bearing: Drive end and opposite end.
  - c. Equipment Casing: Top and side.
  - d. Equipment Base: Top and side.
  - e. Building: Floor.
  - f. Ductwork: To and from equipment after flexible connections.
  - g. Piping: To and from equipment after flexible connections.
- 3. HVAC Equipment with Compressors:
  - a. Compressor Bearing: Drive end and opposite end.
  - b. Motor Bearing: Drive end and opposite end.
  - c. Equipment Casing: Top and side.
  - d. Equipment Base: Top and side.
  - e. Building: Floor.
  - f. Piping: To and from equipment after flexible connections.
- I. For equipment with vibration isolation, take floor measurements with the vibration isolation blocked solid to the floor and with the vibration isolation floating. Calculate and report the differences.
- J. Inspect, measure, and record vibration isolation.
  - 1. Verify that vibration isolation is installed in the required locations.
  - 2. Verify that installation is level and plumb.
  - 3. Verify that isolators are properly anchored.
  - 4. For spring isolators, measure the compressed spring height, the spring OD, and the travel-to-solid distance.
  - 5. Measure the operating clearance between each inertia base and the floor or concrete base below. Verify that there is unobstructed clearance between the bottom of the inertia base and the floor.

### 3.11 TEMPERATURE-CONTROL VERIFICATION

- A. Verify that controllers are calibrated and commissioned.
- B. Check transmitter and controller locations and note conditions that would adversely affect control functions.
- C. Record controller settings and note variances between set points and actual measurements.
- D. Check the operation of limiting controllers (i.e., high- and low-temperature controllers).
- E. Check free travel and proper operation of control devices such as damper and valve operators at all VAV, CV boxes, etc.
- F. Check the sequence of operation of control devices. Note device positions and correlate with airflow and water flow measurements. Note the speed of response to input changes.
- G. Check the interaction of electrically operated switch transducers.
- H. Check the interaction of interlock and lockout systems.



- I. Record voltages of power supply and controller output. Determine whether the system operates on a grounded or nongrounded power supply.
- J. Note operation of electric actuators using spring return for proper fail-safe operations.

### 3.12 TOLERANCES

- A. Set HVAC system airflow and water flow rates within the following tolerances:
  - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 5 to plus 10 percent.
  - 2. Air Outlets and Inlets: 0 to minus 10 percent.

### 3.13 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.
- C. Commissioning: Attend all commissioning meetings and cooperate fully with the owners commissioning agent. Submit all test reports as requested.

### 3.14 FINAL REPORT

- A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.
- B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.
  - 1. Include a list of instruments used for procedures, along with proof of calibration.
- C. Final Report Contents: In addition to certified field report data, include the following:
  - 1. Fan curves.
  - 2. Manufacturers' test data (heat wheels, heat pipes, coils and air handlers).
  - 3. Field test reports prepared by system and equipment installers.
  - 4. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.
- D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:
  - 1. Title page.
  - 2. Name and address of TAB firm.
  - 3. Project name.
  - 4. Project location.
  - 5. Architect's name and address.

6. Engineer's name and address.
  7. Contractor's name and address.
  8. Report date.
  9. Signature of TAB firm who certifies the report.
  10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
  11. Summary of contents including the following:
    - a. Indicated versus final performance.
    - b. Notable characteristics of systems.
    - c. Description of system operation sequence if it varies from the Contract Documents.
  12. Nomenclature sheets for each item of equipment.
  13. Data for terminal units, including manufacturer, type size, and fittings.
  14. Notes to explain why certain final data in the body of reports varies from indicated values.
  15. Test conditions for fans and pump performance forms including the following:
    - a. Settings for outside-, return-, and exhaust-air dampers.
    - b. Conditions of filters.
    - c. Cooling coil, wet- and dry-bulb conditions.
    - d. Fan drive settings including settings and percentage of maximum pitch diameter.
    - e. Air Flow sensors for variable-air-volume systems.
    - f. Settings for supply-air, static-pressure controller.
    - g. Other system operating conditions that affect performance.
- E. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outside, supply, return, and exhaust airflows.
  2. Duct, outlet, and inlet sizes.
  3. Terminal units.
  4. Balancing stations.
  5. Position of balancing devices.
- F. Air-Handling Unit Test Reports: For air-handling units with coils, include the following:
1. Unit Data: Include the following:
    - a. Unit identification.
    - b. Location.
    - c. Make and type.
    - d. Model number and unit size.
    - e. Manufacturer's serial number.
    - f. Unit arrangement and class.
    - g. Discharge arrangement.
    - h. Sheave make, size in inches (mm), and bore.
    - i. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).
    - j. Number of belts, make, and size.
    - k. Number of filters, type, and size.
  2. Motor Data:
    - a. Make and frame type and size.
    - b. Horsepower and rpm.
    - c. Volts, phase, and hertz.
    - d. Full-load amperage and service factor.

- e. Sheave make, size in inches (mm), and bore.
  - f. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).
3. Test Data (Indicated and Actual Values):
- a. Total airflow rate in cfm.
  - b. Total system static pressure in inches wg.
  - c. Fan rpm.
  - d. Discharge static pressure in inches wg.
  - e. Filter static-pressure differential in inches wg.
  - f. Heat Pipe or Heat Wheel static-pressure differential in inches wg.
  - g. Cooling coil static-pressure differential in inches wg.
  - h. Heating coil static-pressure differential in inches wg.
  - i. Outside airflow in cfm.
  - j. Return airflow in cfm.
  - k. Outside-air damper position.
  - l. Return-air damper position.
  - m. VFD settings.
- G. Apparatus-Coil Test Reports:
1. Coil Data:
    - a. System identification.
    - b. Location.
    - c. Coil type.
    - d. Number of rows.
    - e. Fin spacing in fins per inch (mm) o.c.
    - f. Make and model number.
    - g. Face area in sq. ft. (sq. m).
    - h. Tube size in NPS (DN).
    - i. Tube and fin materials.
    - j. Circuiting arrangement.
  2. Test Data (Indicated and Actual Values):
    - a. Airflow rate in cfm (L/s).
    - b. Average face velocity in fpm (m/s).
    - c. Air pressure drop in inches wg (Pa).
    - d. Outside-air, wet- and dry-bulb temperatures in deg F (deg C).
    - e. Return-air, wet- and dry-bulb temperatures in deg F (deg C).
    - f. Entering-air, wet- and dry-bulb temperatures in deg F (deg C).
    - g. Leaving-air, wet- and dry-bulb temperatures in deg F (deg C).
    - h. Water flow rate in gpm (L/s).
    - i. Water pressure differential in feet of head or psig (kPa).
    - j. Entering-water temperature in deg F (deg C).
    - k. Leaving-water temperature in deg F (deg C).
    - l. Refrigerant expansion valve and refrigerant types. (Air cooled chiller)
    - m. Refrigerant suction pressure in psig (kPa). (air cooled chiller)
    - n. Refrigerant suction temperature in deg F (deg C). (air cooled chiller)
- H. Fan Test Reports: For supply, return and exhaust fans, include the following:
1. Fan Data:
    - a. System identification.
    - b. Location.
    - c. Make and type.
    - d. Model number and size.

- e. Manufacturer's serial number.
  - f. Arrangement and class.
  - g. Sheave make, size in inches (mm), and bore.
  - h. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).
2. Motor Data:
    - a. Make and frame type and size.
    - b. Horsepower and rpm.
    - c. Volts, phase, and hertz.
    - d. Full-load amperage and service factor.
    - e. Sheave make, size in inches (mm), and bore.
    - f. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).
    - g. Number of belts, make, and size.
  3. Test Data (Indicated and Actual Values):
    - a. Total airflow rate in cfm (L/s).
    - b. Total system static pressure in inches wg (Pa).
    - c. Fan rpm.
    - d. Discharge static pressure in inches wg (Pa).
    - e. Suction static pressure in inches wg (Pa).
- I. Round and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
1. Report Data:
    - a. System and air-handling unit number.
    - b. Location and zone.
    - c. Traverse air temperature in deg F (deg C).
    - d. Duct static pressure in inches wg (Pa).
    - e. Duct size in inches (mm).
    - f. Duct area in sq. ft. (sq. m).
    - g. Indicated airflow rate in cfm (L/s).
    - h. Indicated velocity in fpm (m/s).
    - i. Actual airflow rate in cfm (L/s).
    - j. Actual average velocity in fpm (m/s).
    - k. Barometric pressure in psig (Pa).
- J. Air-Terminal-Device Reports:
1. Unit Data:
    - a. System and air-handling unit identification.
    - b. Location and zone.
    - c. Test apparatus used.
    - d. Area served.
    - e. Air-terminal-device make.
    - f. Air-terminal-device number from system diagram.
    - g. Air-terminal-device type and model number.
    - h. Air-terminal-device size.
    - i. Air-terminal-device effective area in sq. ft. (sq. m).
  2. Test Data (Indicated and Actual Values):
    - a. Airflow rate in cfm (L/s).
    - b. Air velocity in fpm (m/s).
    - c. Preliminary airflow rate as needed in cfm (L/s).
    - d. Preliminary velocity as needed in fpm (m/s).

- e. Final airflow rate in cfm (L/s).
  - f. Final velocity in fpm (m/s).
  - g. Space temperature in deg F (deg C).
- K. System-Coil Reports: For zone coils and water coils of terminal units, include the following:
- 1. Unit Data:
    - a. System and air-handling unit identification.
    - b. Location and zone.
    - c. Room or riser served.
    - d. Coil make and size.
    - e. Flowmeter type.
  - 2. Test Data (Indicated and Actual Values):
    - a. Airflow rate in cfm (L/s).
    - b. Entering-air temperature in deg F (deg C).
    - c. Leaving-air temperature in deg F (deg C).
- L. Vibration Measurement Reports:
- 1. Date and time of test.
  - 2. Vibration meter manufacturer, model number, and serial number.
  - 3. Equipment designation, location, equipment, speed, motor speed, and motor horsepower.
  - 4. Diagram of equipment showing the vibration measurement locations.
  - 5. Measurement readings for each measurement location.
  - 6. Calculate isolator efficiency using measurements taken.
  - 7. Description of predominant vibration source.
- M. Instrument Calibration Reports:
- 1. Report Data.
    - a. Instrument type and make.
    - b. Serial number.
    - c. Application.
    - d. Dates of use.
    - e. Dates of calibration.

### 3.15 INSPECTIONS

- A. Initial Inspection:
- 1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the Final Report.
  - 2. Randomly check the following for each system:
    - a. Measure airflow of at least 10 percent of air outlets.
    - b. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
    - c. Measure sound levels at two locations.
    - d. Measure space pressure of at least 10 percent of locations.
    - e. Verify that balancing devices are marked with final balance position.
    - f. Note deviations to the Contract Documents in the Final Report.

END OF SECTION

## SECTION 23 07 00

### HVAC Insulation

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 SUMMARY

- A. Section Includes:
  - 1. Insulation Materials:
    - a. Calcium silicate.
    - b. Flexible elastomeric.
    - c. Mineral fiber (blanket and board).
  - 2. Fire-rated insulation systems.
  - 3. Insulating cements.
  - 4. Adhesives.
  - 5. Mastics.
  - 6. Lagging adhesives.
  - 7. Sealants.
  - 8. Factory-applied jackets.
  - 9. Field-applied fabric-reinforcing mesh.
  - 10. Field-applied cloths.
  - 11. Field-applied jackets.
  - 12. Tapes.
  - 13. Securements.
- B. Related Sections:
  - 1. Division 23 Section "Common Works Results for HVAC."
  - 2. Division 23 Section "Hydronic Pumps."
  - 3. Division 23 Section "Piping."
  - 4. Division 23 Section "Metal Ducts."

##### 1.03 SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).
- B. Shop Drawings:
  - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
  - 2. Detail attachment and covering of heat tracing inside insulation.
  - 3. Detail insulation application at pipe expansion joints for each type of insulation.
  - 4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.

5. Detail removable insulation at piping specialties, equipment connections, and access panels.
  6. Detail application of field-applied jackets.
  7. Detail application at linkages of control devices.
  8. Detail field application for each equipment type.
- C. Qualification Data: Provide a firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this project, whose work has resulted in construction with a record of successful in-service performance.
- D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- E. Field quality-control reports.

#### 1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less and as tested and certified in accordance with ASTM E-84.
  2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

#### 1.06 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with Piping Installer for piping insulation application, Duct Installer for duct insulation application, and Equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

## 1.07 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## 1.08 DEFINITIONS

- A. Indoor Exposed: Indoor ducts, piping or equipment located in mechanical equipment rooms, penthouse, and in areas which will be visible without removing ceilings or opening access panels.
- B. Indoor Concealed: Indoor ducts, piping or equipment which are not exposed to the weather.
- C. Outdoor: All Ducts, piping or equipment which is exposed to the weather. All piping outdoors is considered to be exposed to the weather

## PART 2 - PRODUCTS

### 2.01 INSULATION MATERIALS

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied. Refer to paragraph 3.14 for insulation schedules.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Calcium Silicate:
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. Industrial Insulation Group (The); Thermo-12 Gold.
  - 2. Preformed Pipe Sections: Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with a non-asbestos fibrous reinforcement. Comply with ASTM C 533, Type I.
  - 3. Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with a non-asbestos fibrous reinforcement. Comply with ASTM C 533, Type I.
  - 4. Prefabricated Fitting Covers: Comply with ASTM C450 and ASTM C585 for dimensions used in performing insulation to cover valves, elbows, tees and flanges.
- G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-



applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Johns Manville; Microlite.
  - b. Knauf Insulation; Duct Wrap.
  - c. Owens Corning; All-Service Duct Wrap.
  - d. Certainteed Corp; Duct Wrap.
  
- H. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. For equipment applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
  1. Products: Subject to compliance with requirements, provide the following:
    - a. Johns Manville; 800 Series Spin-Glas.
    - b. Knauf Insulation; Insulation Board.
    - c. Owens Corning; Fiberglas 700 Series.
    - d. Certainteed Corp; Commercial Board
  
- I. High Temperature, Mineral Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C553, type V, without factory applied jacket.
  1. Products: Subject to compliance with requirements. Provide the following:
    - a. Johns Manville; HTB 23 Spin-Glas.
    - b. Owens Corning; High temperature flexible batt insulations.
  
- J. Mineral-Fiber, Preformed Pipe Insulation:
  1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated
    - a. Fibrex Insulations Inc.; Coreplus 1200.
    - b. Johns Manville; Micro-Lok.
    - c. Knauf Insulation; 1000 Pipe Insulation.
    - d. Manson Insulation Inc.; Alley-K.
    - e. Owens Corning; Fiberglas Pipe Insulation.
  2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
  
- K. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
  1. Products: Subject to compliance with requirements, provide the following :
    - a. Johns Manville; MicroFlex.
    - b. Knauf Insulation; Pipe and Tank Insulation.
    - c. Manson Insulation Inc.; AK Flex.
    - d. Owens Corning; Fiberglas Pipe and Tank Insulation.
    - e. Certainteed Corp; CrimpWrap.

## 2.02 FIRE-RATED INSULATION SYSTEMS

- A. Fire-Rated Board: Structural-grade, press-molded, xonolite calcium silicate, fireproofing board suitable for operating temperatures up to 1700 deg F. Comply with ASTM C 656, Type II, Grade 6. tested and certified to provide a 2-hour fire rating by a NRTL acceptable to authority having jurisdiction.
  - 1. Products: Subject to compliance with requirements, provide the following :
    - a. Johns Manville; Super Firetemp M.
- B. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by a NRTL acceptable to authority having jurisdiction.
  - 1. Products: Subject to compliance with requirements, provide the following :
    - a. CertainTeed Corp.; FlameChek.
    - b. Johns Manville; Firetemp Wrap.
    - c. Nelson Firestop Products; Nelson FSB Flameshield Blanket.
    - d. Thermal Ceramics; FireMaster Duct Wrap.
    - e. 3M; Fire Barrier Wrap Products.
    - f. Unifrax Corporation; FyreWrap.
    - g. Vesuvius; PYROSCAT FP FASTR Duct Wrap.

## 2.03 INSULATING CEMENTS

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
  - 1. Products: Subject to compliance with requirements, provide the following :
    - a. Insulco, Division of MFS, Inc.; Triple I.
    - b. P. K. Insulation Mfg. Co., Inc.; Super-Stik.
- B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.
  - 1. Products: Subject to compliance with requirements, provide the following :
    - a. P. K. Insulation Mfg. Co., Inc.; Thermal-V-Kote.
- C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.
  - 1. Products: Subject to compliance with requirements, provide the following :
    - a. Insulco, Division of MFS, Inc.; SmoothKote.
    - b. P. K. Insulation Mfg. Co., Inc.; PK No. 127, and Quik-Cote.
    - c. Rock Wool Manufacturing Company; Delta One Shot.

## 2.04 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Cellular-Glass, Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F (minus 59 to plus 149 deg C).
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. Childers Products, Division of ITW; CP-96.
    - b. Foster Products Corporation, H. B. Fuller Company; 81-33.
- C. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. Aeroflex USA Inc.; Aero seal.
    - b. Armacell LCC; 520 Adhesive.

- c. Foster Products Corporation, H. B. Fuller Company; 85-75.
  - d. RBX Corporation; Rubatex Contact Adhesive.
- D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
- 1. Products: Subject to compliance with requirements, provide the following:
    - a. Childers Products, Division of ITW; CP-82.
    - b. Foster Products Corporation, H. B. Fuller Company; 85-20.
    - c. ITW TACC, Division of Illinois Tool Works; S-90/80.
    - d. Marathon Industries, Inc.; 225.
    - e. Mon-Eco Industries, Inc.; 22-25.
- E. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
- 1. Products: Subject to compliance with requirements, provide the following:
    - a. Childers Products, Division of ITW; CP-82.
    - b. Foster Products Corporation, H. B. Fuller Company; 85-20.
    - c. ITW TACC, Division of Illinois Tool Works; S-90/80.
    - d. Marathon Industries, Inc.; 225.
    - e. Mon-Eco Industries, Inc.; 22-25.
- F. PVC Jacket Adhesive: Compatible with PVC jacket.
- 1. Products: Subject to compliance with requirements, provide the following:
    - a. Dow Chemical Company (The); 739, Dow Silicone.
    - b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
    - c. P.I.C. Plastics, Inc.; Welding Adhesive.
    - d. Red Devil, Inc.; Celulon Ultra Clear.
    - e. Speedline Corporation; Speedline Vinyl Adhesive.

## 2.05 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services. All mastics shall have low VOC content in compliance with U.S. Green Building Council/LEED® guidelines.
- 1. Products: Subject to compliance with requirements, provide the following:
    - a. Childers Products, Division of ITW; CP-35.
    - b. Foster Products Corporation, H. B. Fuller Company; 30-90.
    - c. ITW TACC, Division of Illinois Tool Works; CB-50.
    - d. Marathon Industries, Inc.; 590.
    - e. Mon-Eco Industries, Inc.; 55-40.
    - f. Vimasco Corporation; 749.
  - 2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
  - 3. Service Temperature Range: Minus 20 to plus 180 deg F.
  - 4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
  - 5. Color: White.

## 2.06 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. Childers Products, Division of ITW; CP-52.
    - b. Foster Products Corporation, H. B. Fuller Company; 81-42.
    - c. Marathon Industries, Inc.; 130.
    - d. Mon-Eco Industries, Inc.; 11-30.
    - e. Vimasco Corporation; 136.
  - 2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
  - 3. Service Temperature Range: Minus 50 to plus 180 deg F.
  - 4. Color: White.

## 2.07 SEALANTS

- A. Joint Sealants:
- B. FSK and Metal Jacket Flashing Sealants:
  - 1. Products: Subject to compliance with requirements, provide the following :
    - a. Childers Products, Division of ITW; CP-76-8.
    - b. Foster Products Corporation, H. B. Fuller Company; 95-44.
    - c. Marathon Industries, Inc.; 405.
    - d. Mon-Eco Industries, Inc.; 44-05.
    - e. Vimasco Corporation; 750.
  - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
  - 3. Fire- and water-resistant, flexible, elastomeric sealant.
  - 4. Service Temperature Range: Minus 40 to plus 250 deg F.
  - 5. Color: Aluminum.
- C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
  - 1. Products: Subject to compliance with requirements, provide the following :
    - a. Childers Products, Division of ITW; CP-76.
  - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
  - 3. Fire- and water-resistant, flexible, elastomeric sealant.
  - 4. Service Temperature Range: Minus 40 to plus 250 deg F.
  - 5. Color: White.

## 2.08 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
  - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with vapor barrier aluminum-foil backing; complying with ASTM C 1136, Type I.
  - 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
  - 3. FSK Jacket: Aluminum-foil vapor barrier, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
  - 4. FSP Jacket: Aluminum-foil vapor barrier, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
  - 5. PVDC Jacket for Indoor Applications: 4-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to

ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

- a. Products: Subject to compliance with requirements, provide the following :
  - 1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

## 2.09 FIELD-APPLIED FABRIC-REINFORCING MESH

- A. Woven Glass-Fiber Fabric for Pipe Insulation: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. inch for covering pipe and pipe fittings.
  1. Products: Subject to compliance with requirements, provide the following :
    - a. Vimasco Corporation; Elastafab 894.
- B. Woven Glass-Fiber Fabric for Duct and Equipment Insulation: Approximately 6 oz./sq. yd. with a thread count of 5 strands by 5 strands/sq. inch for covering equipment.
  1. Products: Subject to compliance with requirements, provide the following :
    - a. Childers Products, Division of ITW; Chil-Glas No. 5.
- C. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. inch, in a Leno weave, for duct, equipment, and pipe.
  1. Products: Subject to compliance with requirements, provide the following :
    - a. Foster Products Corporation, H. B. Fuller Company; Mast-A-Fab.
    - b. Vimasco Corporation; Elastafab 894.

## 2.10 FIELD-APPLIED CLOTHS

- A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd.
  1. Products: Subject to compliance with requirements, provide the following :
    - a. Alpha Associates, Inc.; Alpha-Maritex 84215 and 84217/9485RW, Luben 59.

## 2.11 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. FSK Jacket: Aluminum-foil-face vapor barrier, fiberglass-reinforced scrim with kraft-paper backing.
- C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C and ASTM E-84 (25/50); thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
  1. Products: Subject to compliance with requirements, provide the following :
    - a. Johns Manville; Zeston.
    - b. P.I.C. Plastics, Inc.; FG Series.
    - c. Proto PVC Corporation; LoSmoke.
    - d. Speedline Corporation; SmokeSafe.
  2. Adhesive: As recommended by jacket material manufacturer.
  3. Color: White.
  4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

- a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
- 5. Factory-fabricated tank heads and tank side panels.

D. Metal Jacket:

- 1. Products: Subject to compliance with requirements, provide the following :
  - a. Childers Products, Division of ITW; Metal Jacketing Systems.
  - b. PABCO Metals Corporation; Surefit.
  - c. RPR Products, Inc.; Insul-Mate.
- 2. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005, Temper H-14.
  - a. Sheet and roll stock ready for shop or field sizing.
  - b. Finish and thickness are indicated in field-applied jacket schedules.
  - c. Moisture Barrier for Indoor Applications: 1-mil-thick, heat-bonded polyethylene and kraft paper.
  - d. Moisture Barrier for Outdoor Applications: 2.5-mil-thick Polysurlyn.
  - e. Factory-Fabricated Fitting Covers:
    - 1) Same material, finish, and thickness as jacket.
    - 2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    - 3) Tee covers.
    - 4) Flange and union covers.
    - 5) End caps.
    - 6) Beveled collars.
    - 7) Valve covers.
    - 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

- E. Self-Adhesive Outdoor Jacket: 60-mil-thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with whitealuminum-foil facing.
  - 1. Products: Subject to compliance with requirements, provide the following :
    - a. Polyguard; Alumaguard 60.

2.12 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
  - 1. Products: Subject to compliance with requirements, provide the following :
    - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
    - b. Compac Corp.; 104 and 105.
    - c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
    - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
  - 2. Width: 3 inches.
  - 3. Thickness: 11.5 mils.
  - 4. Adhesion: 90 ounces force/inch in width.
  - 5. Elongation: 2 percent.
  - 6. Tensile Strength: 40 lbf/inch in width.
  - 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
  - 1. Products: Subject to compliance with requirements, provide the following :
    - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
    - b. Compac Corp.; 110 and 111.
    - c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
    - d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.
  - 2. Width: 3 inches.
  - 3. Thickness: 6.5 mils.
  - 4. Adhesion: 90 ounces force/inch in width.
  - 5. Elongation: 2 percent.
  - 6. Tensile Strength: 40 lbf/inch in width.
  - 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.
  - 1. Products: Subject to compliance with requirements, provide the following :
    - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
    - b. Compac Corp.; 130.
    - c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
    - d. Venture Tape; 1506 CW NS.
  - 2. Width: 2 inches.
  - 3. Thickness: 6 mils.
  - 4. Adhesion: 64 ounces force/inch in width.
  - 5. Elongation: 500 percent.
  - 6. Tensile Strength: 18 lbf/inch in width.
- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
  - 1. Products: Subject to compliance with requirements, provide the following :
    - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
    - b. Compac Corp.; 120.
    - c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
    - d. Venture Tape; 3520 CW.
  - 2. Width: 2 inches.
  - 3. Thickness: 3.7 mils.
  - 4. Adhesion: 100 ounces force/inch in width.
  - 5. Elongation: 5 percent.
  - 6. Tensile Strength: 34 lbf/inch in width.

## 2.13 SECUREMENTS

- A. Bands:
  - 1. Products: Subject to compliance with requirements, provide the following :
    - a. Childers Products; Bands.
    - b. PABCO Metals Corporation; Bands.
    - c. RPR Products, Inc.; Bands.
  - 2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with wing or closed seal.
  - 3. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing or closed seal.
  - 4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
  - a. Products: Subject to compliance with requirements, provide the following :
    - 1) AGM Industries, Inc.; CWP-1.
    - 2) GEMCO; CD.
    - 3) Midwest Fasteners, Inc.; CD.
    - 4) Nelson Stud Welding; TPA, TPC, and TPS.
2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
  - a. Products: Subject to compliance with requirements, provide the following :
    - 1) AGM Industries, Inc.; CWP-1.
    - 2) GEMCO; Cupped Head Weld Pin.
    - 3) Midwest Fasteners, Inc.; Cupped Head.
    - 4) Nelson Stud Welding; CHP.
3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
  - a. Products: Subject to compliance with requirements, provide the following :
    - 1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series T.
    - 2) GEMCO; Perforated Base.
    - 3) Midwest Fasteners, Inc.; Spindle.
  - b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
  - c. Spindle: Copper- or zinc-coated, low carbon steel Aluminum, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
  - d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
4. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
  - a. Products: Subject to compliance with requirements, provide the following :
    - 1) GEMCO; Nylon Hangers.
    - 2) Midwest Fasteners, Inc.; Nylon Insulation Hangers.
  - b. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
  - c. Spindle: Nylon, 0.106-inch-diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
  - d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
5. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position



indicated when self-locking washer is in place. Comply with the following requirements:

- a. Products: Subject to compliance with requirements, provide the following :
    - 1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series TSA.
    - 2) GEMCO; Press and Peel.
    - 3) Midwest Fasteners, Inc.; Self Stick.
  - b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
  - c. Spindle: Copper- or zinc-coated, low carbon steel Aluminum, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
  - d. Adhesive-backed base with a peel-off protective cover.
6. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, aluminum sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.
- a. Products: Subject to compliance with requirements, provide the following :
    - 1) AGM Industries, Inc.; RC-150.
    - 2) GEMCO; R-150.
    - 3) Midwest Fasteners, Inc.; WA-150.
    - 4) Nelson Stud Welding; Speed Clips.
  - b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
7. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
- a. Products: Subject to compliance with requirements, provide the following :
    - 1) GEMCO.
    - 2) Midwest Fasteners, Inc.
- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.
- D. Wire: 0.062-inch soft-annealed, stainless steel.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. C & F Wire.
    - b. Childers Products.
    - c. PABCO Metals Corporation.
    - d. RPR Products, Inc.

#### 2.14 THERMAL-HANGER SHIELD INSERTS

- A. Description: 100 PSIG minimum, compressive-strength insulation insert encased in sheet metal shield.
- B. Manufacturers:
  1. Carpenter & Paterson, Inc.
  2. ERICO/Michigan Hanger Co.
  3. PHS Industries, Inc.
  4. Pipe Shields, Inc.
  5. Rilco Manufacturing Company, Inc.
  6. Value Engineered Products, Inc.

- C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533 Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.
- D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533 Type I calcium silicate or ASTM C 552, Type II cellular glass.
- E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
  1. Verify that systems and equipment to be insulated have been tested and are free of defects.
  2. Verify that surfaces to be insulated are clean and dry.
  3. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

### 3.03 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth.
  - 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
  - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
    - a. For below ambient services, apply vapor-barrier mastic over staples.
  - 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
  - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above ambient services, do not install insulation to the following:
  - 1. Vibration-control devices.
  - 2. Testing agency labels and stamps.
  - 3. Nameplates and data plates.
  - 4. Manholes.
  - 5. Handholes.

6. Cleanouts.

3.04 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
  - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
  - 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
  - 1. Comply with requirements in Division 07 Section "Penetration Firestopping"irestopping and fire-resistive joint sealers.
- F. Insulation Installation at Floor Penetrations:
  - 1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
  - 2. Pipe: Install insulation continuously through floor penetrations.
  - 3. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.05 EQUIPMENT, TANK, AND VESSEL INSULATION INSTALLATION

- A. Mineral Fiber, Pipe and Tank Insulation Installation for Tanks and Vessels: Secure insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of tank and vessel surfaces.
  2. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
  3. Protect exposed corners with secured corner angles.
  4. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:
    - a. Do not weld anchor pins to ASME-labeled pressure vessels.
    - b. Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
    - c. On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.
    - d. Do not overcompress insulation during installation.
    - e. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.
    - f. Impale insulation over anchor pins and attach speed washers.
    - g. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
  5. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
  6. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie wire or bands.
  7. Stagger joints between insulation layers at least 3 inches.
  8. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
  9. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
  10. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.
- B. Flexible Elastomeric Thermal Insulation Installation for Tanks and Vessels: Install insulation over entire surface of tanks and vessels.
1. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.
  2. Seal longitudinal seams and end joints.
- C. Insulation Installation on Pumps:
1. Fabricate metal boxes lined with insulation. Fit boxes around pumps and coincide box joints with splits in pump casings. Fabricate joints with outward bolted flanges. Bolt flanges on 6-inch centers, starting at corners. Install 3/8-

- inch-diameter fasteners with wing nuts. Alternatively, secure the box sections together using a latching mechanism.
2. Fabricate boxes from galvanized steel , at least 0.050 inch thick.
  3. For below ambient services, install a vapor barrier at seams, joints, and penetrations. Seal between flanges with replaceable gasket material to form a vapor barrier.

### 3.06 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
  1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
  2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
  3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
  4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
  5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
  6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
  7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
  8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
  2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
  3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
  4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
  5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.
- E. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Pip-Covering Protection Saddles (MSS Type 39)): To fill interior voids with insulation that matches adjoining insulation.
  2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
  3. Thermal-Hanger Shield Inserts: For supporting insulated pipe. Include steel weight distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

### 3.07 CALCIUM SILICATE INSULATION INSTALLATION

- A. Insulation Installation on Boiler Breechings and Ducts:
1. Secure single-layer insulation with stainless-steel bands at 12-inch (300-mm) intervals and tighten bands without deforming insulation material.
  2. Install 2-layer insulation with joints tightly butted and staggered at least 3 inches (75 mm). Secure inner layer with wire spaced at 12-inch (300-mm) intervals. Secure outer layer with stainless-steel bands at 12-inch (300-mm) intervals.
  3. On exposed applications without metal jacket, finish insulation surface with a skim coat of mineral-fiber, hydraulic-setting cement. When cement is dry, apply flood coat of lagging adhesive and press on one layer of glass cloth. Overlap

edges at least 1 inch (25 mm). Apply finish coat of lagging adhesive over glass cloth. Thin finish coat to achieve smooth, uniform finish.

B. Insulation Installation on Straight Pipes and Tubes:

1. Secure single-layer insulation with stainless-steel bands at 12-inch (300-mm) intervals and tighten bands without deforming insulation materials.
2. Install 2-layer insulation with joints tightly butted and staggered at least 3 inches (75 mm). Secure inner layer with wire spaced at 12-inch (300-mm) intervals. Secure outer layer with stainless-steel bands at 12-inch (300-mm) intervals.
3. Apply a skim coat of mineral-fiber, hydraulic-setting cement to insulation surface. When cement is dry, apply flood coat of lagging adhesive and press on one layer of glass cloth or tape. Overlap edges at least 1 inch (25 mm). Apply finish coat of lagging adhesive over glass cloth or tape. Thin finish coat to achieve smooth, uniform finish.

C. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of same material and thickness as pipe insulation.
4. Finish flange insulation same as pipe insulation.

D. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed insulation sections of insulation are not available, install mitered sections of calcium silicate insulation. Secure insulation materials with wire or bands.
3. Finish fittings insulation same as pipe insulation.

E. Insulation Installation on Valves and Pipe Specialties:

1. Install mitered segments of calcium silicate insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
2. Install insulation to flanges as specified for flange insulation application.
3. Finish valve and specialty insulation same as pipe insulation.

### 3.08 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.



4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
1. Install mitered sections of pipe insulation.
  2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed valve covers manufactured of same material as pipe insulation when available.
  2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
  3. Install insulation to flanges as specified for flange insulation application.
  4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

### 3.09 MINERAL-FIBER INSULATION INSTALLATION

- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
  2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
  3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
  4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.
  2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
  3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
  4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.
- C. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
  2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
- D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
  2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
  3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
  4. Install insulation to flanges as specified for flange insulation application.
- E. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
  2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
  3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
    - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    - d. Do not overcompress insulation during installation.
    - e. Impale insulation over pins and attach speed washers.
    - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
  4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
    - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.
  5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
  6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.
- F. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
  2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
  3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
    - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    - b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    - d. Do not overcompress insulation during installation.
    - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
  4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
    - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.
  5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
  6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

### 3.10 FIELD-APPLIED JACKET INSTALLATION

- A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
  2. Embed glass cloth between two 0.062-inch-thick coats of lagging adhesive.
  3. Completely encapsulate insulation with coating, leaving no exposed insulation.
- B. Where FSK jackets are indicated, install as follows:
1. Draw jacket material smooth and tight.
  2. Install lap or joint strips with same material as jacket.
  3. Secure jacket to insulation with manufacturer's recommended adhesive.
  4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
  5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.
1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

### 3.11 FIRE-RATED INSULATION SYSTEM INSTALLATION

- A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.
- C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Division 07 Section "Penetration Firestopping."

### 3.12 FINISHES

- A. Duct, Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.
  1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
    - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

### 3.13 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.

- C. Tests and Inspections:
1. Inspect ductwork, randomly selected by Engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
  2. Inspect field-insulated equipment, randomly selected by Engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three location(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
  3. Inspect pipe, fittings, strainers, and valves, randomly selected by Engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, three locations of threaded strainers, three locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

### 3.14 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
1. Indoor, concealed supply and outdoor air.
  2. Indoor, exposed supply and outdoor air.
  3. Indoor, return located in the penthouse and mechanical rooms.
  4. Indoor, concealed exhaust between automatic damper and penetration of building exterior.
  5. Indoor, exposed exhaust between automatic damper and penetration of building exterior.
  6. Indoor, concealed, type I, commercial kitchen hood exhaust.
  7. Indoor, exposed, type I, commercial kitchen hood exhaust.
  8. Indoor, concealed oven and warewash exhaust.
  9. Indoor, exposed over and warewash exhaust.
- B. Items Not Insulated:
1. Fibrous-glass ducts.
  2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
  3. Factory-insulated flexible ducts.
  4. Factory-insulated plenums and casings.
  5. Flexible connectors.
  6. Vibration-control devices.
  7. Factory-insulated access panels and doors.
  8. Return ducts in return air plenums and shafts.

### 3.15 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, round and flat-oval, supply-air duct insulation shall be the following:
1. Mineral-Fiber Blanket: 1-1/2 inches (38 mm) thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density.

- B. Concealed, round and flat-oval, return-air duct insulation (in unconditioned space) shall be the following:
  - 1. Mineral-Fiber Blanket: 2 inches (51 mm) thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density.
- C. Concealed, round and flat-oval, outdoor-air duct insulation shall be the following:
  - 1. Mineral-Fiber Board: 2 inches (51 mm) thick and 6-lb/cu. ft. (96-kg/cu. m) nominal density.
- D. Concealed, round and flat-oval, exhaust-air duct insulation between automatic damper and penetration of building exterior shall be the following:
  - 1. Mineral-Fiber Blanket: 1-1/2 inches (38 mm) thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density.
- E. Concealed, rectangular, supply-air duct insulation shall be the following:
  - 1. Mineral-Fiber Blanket: 1-1/2 inches (38 mm) thick and 0.75-lb/cu. ft. nominal density.
- F. Concealed, rectangular, return-air duct insulation (in unconditioned space )shall be the following:
  - 1. Mineral-Fiber Blanket: 2 inches (51 mm) thick and 0.75-lb/cu. ft. nominal density.
- G. Concealed, rectangular, outdoor-air duct insulation shall be the following:
  - 1. Mineral-Fiber Board: 2 inches (51 mm) thick and 6-lb/cu. ft. (96-kg/cu. m) nominal density
- H. Concealed, rectangular, exhaust-air duct insulation between isolation damper and penetration of building exterior shall be the following:
  - 1. Mineral-Fiber Board: 2 inches (51 mm) thick and 6-lb/cu. ft. (96-kg/cu. m) nominal density
- I. Concealed, Type I, Commercial, Kitchen Hood Exhaust Duct and Plenum Insulation: Fire-rated blanket or board; thickness as required to achieve 2-hour fire rating.
- J. Concealed, outdoor-air plenum insulation(in unconditioned space) shall be the following:
  - 1. Mineral-Fiber Board: 2 inches (51 mm) thick and 6-lb/cu. ft. (96-kg/cu. m) nominal density.
- K. Concealed, exhaust-air plenum insulation shall be the following:
  - 1. Mineral-Fiber Board: 2 inches (51 mm) thick and 6-lb/cu. ft. (96-kg/cu. m) nominal density.
- L. Exposed, round and flat-oval, supply-air duct insulation shall be the following:
  - 1. Mineral-Fiber Board: 1-1/2 inches (38 mm) thick and 6-lb/cu. ft. (96-kg/cu. m) nominal density.
- M. Exposed, round and flat-oval, return-air duct insulation in unconditioned space) shall be the following:
  - 1. Mineral-Fiber Board: 1-1/2 inches (38 mm) thick and 6-lb/cu. ft. (96-kg/cu. m) nominal density.
- N. Exposed, round and flat-oval, outdoor-air duct insulation shall be the following:
  - 1. Mineral-Fiber Board: 2 inches (51 mm) thick and 6-lb/cu. ft. (96-kg/cu. m) nominal density.
- O. Exposed, round and flat-oval, exhaust-air duct insulation shall be the following:

1. Mineral-Fiber Board: 1-1/2 inches (38 mm) thick and 6-lb/cu. ft. (96-kg/cu. m) nominal density.
- P. Exposed, rectangular, supply-air duct insulation shall be the following:
1. Mineral-Fiber Board: 1-1/2 inches (38 mm) thick and 6-lb/cu. ft. (96 kg/cu. m) nominal density.
- Q. Exposed, rectangular, return-air duct insulation (in unconditioned space) shall be the following:
1. Mineral-Fiber Board: 1-1/2 inches (38 mm) thick and 6-lb/cu. ft. (96-kg/cu. m) nominal density.
- R. Exposed, rectangular, outdoor-air duct insulation shall be the following:
1. Mineral-Fiber Board: 2 inches (51 mm) thick and 6-lb/cu. ft. (96-kg/cu. m) nominal density.
- S. Exposed, rectangular, exhaust-air duct insulation shall be the following:
1. Mineral-Fiber Board: 1-1/2 inches (38 mm) thick and 6-lb/cu. ft. (96-kg/cu. m) nominal density.
- T. Exposed, Type I, Commercial, Kitchen Hood Exhaust Duct and Plenum Insulation: Fire-rated blanket or board; thickness as required to achieve 2-hour fire rating.
- U. Exposed, outdoor-air plenum insulation shall be the following:
1. Mineral-Fiber Board: 2 inches (51 mm) thick and 6-lb/cu. ft. (96-kg/cu. m) nominal density.
- V. Exposed, exhaust-air plenum insulation shall be the following:
1. Mineral-Fiber Board: 2 inches (51 mm) thick and 6-lb/cu. ft. (96-kg/cu. m) nominal density.

### 3.16 EQUIPMENT INSULATION SCHEDULE

- A. Insulation materials and thicknesses are identified below.
- B. Insulate indoor and outdoor equipment in paragraphs below that is not factory insulated.
- C. Chilled-water pumps insulation shall be the following:
  1. Mineral-Fiber Board: 2 inches thick and 6-lb/cu. ft. nominal density.
- D. Heating-hot-water pump insulation shall be the following:
  1. Mineral-Fiber Board: 2 inches (50 mm) thick and 6-lb/cu. ft. (96-kg/cu. m) nominal density.
- E. Heating-hot-water and chilled water air-separator insulation shall be the following:
  1. Mineral-Fiber Board: 2 inches thick and 6-lb/cu. ft. nominal density.

### 3.17 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
  1. Drainage piping located in crawl spaces.

2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

### 3.18 INDOOR PIPING INSULATION SCHEDULE

- A. Cold water Makeup, condensate and Equipment Drain Water below 60 Deg F:
  1. All Pipe Sizes: Insulation shall be the following:
    - a. Mineral Fiber Preformed pipe type I: 1 inch thick
- B. Chilled Water Supply and Return, 40 Deg F
  1. NPS 3 and smaller: Insulation shall be the following:
    - a. Mineral Fiber Preformed pipe type I : 1 inch thick
  2. NPS 4 TO NPS 12 : Insulation shall be the following:
    - a. Mineral Fiber Preformed pipe insulation type 1: 1-1/2 inch thick
  3. NPS 14 and larger: Insulation to be the followings;
    - a. Mineral Fiber Preformed pipe insulation type 1: 1-1/2 inch thick
- C. Heating-Hot-Water Supply and Return, 200 Deg F and below:
  1. NPS 12 inches and Smaller: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe, Type I: 1 ½ inches thick.
- D. Refrigerant Suction and Hot-Gas Piping:
  1. All Pipe Sizes: Insulation shall be the following:
    - a. Flexible Elastomeric: 1 inch thick.
- E. Hot Service Drains:
  1. All Pipe Sizes: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe, Type I or II: 1 inch thick.
- F. Hot Service Vents:
  1. All Pipe Sizes: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe, Type I or II: 1 inch thick.
- G. Steam and Steam Condensate, 350 Deg F (177 Deg C) and below:
  1. NPS ¾ inches and Smaller: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe, Type I or II: 2 inches (50 mm) thick.
  2. NPS 1 inch to 6 inch: Insulation shall be the following:
    - a. Mineral- Fiber, Performed Pipe, Type I or II: 3 inches (75 mm) thick.
  3. NPS 8 inch and Larger: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe, Type I or II: 4 inches (100 mm) thick.
- H. Steam and Steam Condensate, above 350 Deg F (177 Deg C):
  1. NPS ¾ inches and Smaller: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe, Type I or II: 2 inches (50 mm) thick.
  2. NPS 1 inch and Larger: Insulation shall be the following:
    - a. Mineral- Fiber, Preformed Pipe, Type I or II: 3 inches (75 mm) thick.

### 3.19 OUTDOOR, ABOVEGROUND AND UNHEATED ENCLOSURE PIPING INSULATION SCHEDULE

- A. Piping that is exposed to outside elements or below building ambient temperatures shall be heat traced and insulated. Coordinate all requirements with electrical contractor for piping lengths. All piping insulation installed outdoors or exposed above ground shall be protected by a wrapped weather proof all aluminum heavy duty jacket (.050" thick) with z-shaped locking seams.



- B. Cold water Makeup and Equipment Drain Water:
  - 1. All Pipe Sizes: Insulation shall be the following:
    - a. Mineral Fiber Preformed pipe type I: 1-1/2 inch thick
    - b. Allow for heat traced piping surfaces
- C. Chilled Water Supply and Return:
  - 1. All Pipe Sizes: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 3 inches (75 mm) thick.
- D. Heating-Hot-Water Supply and Return, 200 Deg F and below:
  - 1. All Pipe Sizes: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I or II: 1 ½ inches (50 mm) thick.
    - b. Allow for heat traced piping surfaces.
- E. Refrigerant Suction and Hot-Gas Piping:
  - 1. All Pipe Sizes: Insulation shall be the following:
    - a. Flexible Elastomeric: 2 inches thick.

### 3.20 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. Ducts and Plenums, Concealed:
  - 1. None.
- C. Ducts and Plenums, Exposed:
  - 1. None.
- D. Equipment, Concealed:
  - 1. None.
- E. Equipment, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:
  - 1. None.
- F. Equipment, Exposed, Larger Than 48 Inches in Diameter or with Flat Surfaces Larger Than 72 Inches:
  - 1. None.
- G. Piping, Concealed:
  - 1. None.
- H. Piping, exposed:
  - 1. PVC Jackets in Mechanical rooms up to 10 feet AFF and on all exposed piping in occupied spaces.
- I. Piping, Fittings and Elbows:
  - 1. PVC fitting Jackets on all pipe fittings, elbows, valves, tees and mechanical couplings.
  - 2. Extended valve stems shall be fitted with PVC jackets and insulation.
  - 3. Provide continuous vapor barrier on all cold surfaces.

3.21 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Exposed:
  - 1. Painted Aluminum, Smooth Corrugated with Z-Shaped Locking Seam: 0.020 inch (0.51 mm) 0.024 inch (0.61 mm) thick.

END OF SECTION

## SECTION 232300

### REFRIGERANT PIPING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes refrigerant piping used for air-conditioning applications.

##### 1.2 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for Refrigerant R-410A:
  - 1. Suction Lines for Air-Conditioning Applications: 185 psig.
  - 2. Suction Lines for Heat-Pump Applications: 325 psig.
  - 3. Hot-Gas and Liquid Lines: 325 psig.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop based on manufacturer's test data.
- B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.
  - 1. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

- C. Field quality-control test reports.
- D. Operation and maintenance data.

##### 1.4 QUALITY ASSURANCE

- A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

##### 1.5 PRODUCT STORAGE AND HANDLING

- A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

## PART 2 - PRODUCTS

### 2.1 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 88, Type K or L.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- E. Brazing Filler Metals: AWS A5.8.
- F. Flexible Connectors:
  - 1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
  - 2. End Connections: Socket ends.
  - 3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
  - 4. Pressure Rating: Factory test at minimum 500 psig.
  - 5. Maximum Operating Temperature: 250 deg F.

### 2.2 VALVES AND SPECIALTIES

- A. Diaphragm Packless Valves:
  - 1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
  - 2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
  - 3. Operator: Rising stem and hand wheel.
  - 4. Seat: Nylon.
  - 5. End Connections: Socket, union, or flanged.
  - 6. Working Pressure Rating: 500 psig.
  - 7. Maximum Operating Temperature: 275 deg F.
- B. Packed-Angle Valves:
  - 1. Body and Bonnet: Forged brass or cast bronze.
  - 2. Packing: Molded stem, back seating, and replaceable under pressure.
  - 3. Operator: Rising stem.
  - 4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
  - 5. Seal Cap: Forged-brass or valox hex cap.
  - 6. End Connections: Socket, union, threaded, or flanged.
  - 7. Working Pressure Rating: 500 psig.
  - 8. Maximum Operating Temperature: 275 deg F.

C. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F.

D. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

E. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.

1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 deg F.
8. Manual operator.

F. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Seat Disc: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig.
6. Maximum Operating Temperature: 240 deg F.

G. Thermostatic Expansion Valves: Comply with ARI 750.

1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Suction Temperature: 40 deg F.
6. Superheat: Adjustable.
7. Reverse-flow option (for heat-pump applications).

8. End Connections: Socket, flare, or threaded union.
  9. Working Pressure Rating: 700 psig.
- H. Straight-Type Strainers:
1. Body: Welded steel with corrosion-resistant coating.
  2. Screen: 100-mesh stainless steel.
  3. End Connections: Socket or flare.
  4. Working Pressure Rating: 500 psig.
  5. Maximum Operating Temperature: 275 deg F.
- I. Angle-Type Strainers:
1. Body: Forged brass or cast bronze.
  2. Drain Plug: Brass hex plug.
  3. Screen: 100-mesh monel.
  4. End Connections: Socket or flare.
  5. Working Pressure Rating: 500 psig.
  6. Maximum Operating Temperature: 275 deg F.
- J. Moisture/Liquid Indicators:
1. Body: Forged brass.
  2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
  3. Indicator: Color coded to show moisture content in ppm.
  4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
  5. End Connections: Socket or flare.
  6. Working Pressure Rating: 500 psig.
  7. Maximum Operating Temperature: 240 deg F.
- K. Replaceable-Core Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
  2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
  3. Desiccant Media: Activated alumina or charcoal.
  4. Designed for reverse flow (for heat-pump applications).
  5. End Connections: Socket.
  6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
  7. Maximum Pressure Loss: 2 psig.
  8. Working Pressure Rating: 500 psig.
  9. Maximum Operating Temperature: 240 deg F.
- L. Permanent Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted-steel shell.
  2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
  3. Desiccant Media: Activated alumina or charcoal.
  4. Designed for reverse flow (for heat-pump applications).

5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 240 deg F.

M. Liquid Accumulators: Comply with ARI 495.

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig.
4. Maximum Operating Temperature: 275 deg F.

### 2.3 REFRIGERANTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

C. ASHRAE 34, R-410A: Puron.

## PART 3 - EXECUTION

### 3.1 PIPING APPLICATIONS

A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.

B. Suction Lines NPS 2 to NPS 4 for Conventional Air-Conditioning Applications: Copper, Type K, drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

C. Hot-Gas and Liquid Lines and Suction Lines for Heat-Pump Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.

D. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type L, drawn-temper tubing and wrought-copper fittings with soldered joints.

E. Hot-Gas and Liquid Lines and Suction Lines for Heat-Pump Applications:

1. NPS 1-1/2 and Smaller: Copper, Type L, drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

2. NPS 2 to NPS 3: Copper, Type K, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
  3. NPS 4: Copper, Type K, drawn-temper tubing and wrought-copper fittings with soldered joints.
- F. Safety-Relief-Valve Discharge Piping: Copper, Type K, drawn-temper tubing and wrought-copper fittings with soldered joints.
- G. Safety-Relief-Valve Discharge Piping:
1. NPS 1-1/2 and Smaller: Copper, Type L, drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
  2. NPS 2 to NPS 3: Copper, Type K, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
  3. NPS 4: Copper, Type K, drawn-temper tubing and wrought-copper fittings with soldered joints.

### 3.2 VALVE AND SPECIALTY APPLICATIONS

- A. Install diaphragm packless valves in suction and discharge lines of compressor.
- B. Install service valves for gage taps at strainers if they are not an integral part of strainers.
- C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.
- D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.
- E. Install a full-sized, three-valve bypass around filter dryers.
- F. Install solenoid valves upstream from each expansion valve. Install solenoid valves in horizontal lines with coil at top.
- G. Install thermostatic expansion valves as close as possible to distributors on evaporators.
  1. Install valve so diaphragm case is warmer than bulb.
  2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
  3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.
- H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.
- I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.
- J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:



1. Solenoid valves.
  2. Thermostatic expansion valves.
  3. Compressor.
- K. Install filter dryers in liquid line between compressor and thermostatic expansion valve and in the suction line at the compressor.
- L. Install flexible connectors at compressors.

### 3.3 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Refer to Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls" for solenoid valve controllers, control wiring, and sequence of operation.
- K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.
- M. Install refrigerant piping in protective conduit where installed belowground.

- N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- O. Slope refrigerant piping as follows:
  - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
  - 2. Install horizontal suction lines with a uniform slope downward to compressor.
  - 3. Install traps and double risers to entrain oil in vertical runs.
  - 4. Liquid lines may be installed level.
- P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- Q. Install pipe sleeves at penetrations in exterior walls and floor assemblies.
- R. Seal penetrations through fire and smoke barriers according to Division 07 Section "Penetration Firestopping."
- S. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- T. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.
- U. Seal pipe penetrations through exterior walls according to Division 07 Section "Joint Sealants" for materials and methods.
- V. Identify refrigerant piping and valves according to Division 23 Section "Identification for HVAC Piping and Equipment."

### 3.4 PIPE JOINT CONSTRUCTION

- A. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- B. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
  - 1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
  - 2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

### 3.5 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor products are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
  2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
  3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
  4. Spring hangers to support vertical runs.
  5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
  2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
  3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
  4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
  5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
  6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
  7. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
  8. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.
  9. NPS 4: Maximum span, 12 feet; minimum rod size, 1/2 inch.
- D. Support multifloor vertical runs at least at each floor.

### 3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
1. Comply with ASME B31.5, Chapter VI.
  2. Test refrigerant piping and specialties. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
  3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.
    - a. Fill system with nitrogen to the required test pressure.
    - b. System shall maintain test pressure at the manifold gage throughout duration of test.
    - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

### 3.7 SYSTEM CHARGING

- A. Charge system using the following procedures:
1. Install core in filter dryers after leak test but before evacuation.

2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

### 3.8 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
  1. Open shutoff valves in condenser water circuit.
  2. Verify that compressor oil level is correct.
  3. Open compressor suction and discharge valves.
  4. Open refrigerant valves except bypass valves that are used for other purposes.
  5. Check open compressor-motor alignment and verify lubrication for motors and bearings.
- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

## SECTION 23 31 13

### Metal Ducts

#### 1.01 RELATED DOCUMENTS

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

#### 1.02 SUMMARY

##### A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Double-wall rectangular ducts and fittings.
3. Single-wall round and flat-oval ducts and fittings.
4. Double-wall round and flat-oval ducts and fittings.
5. Sheet metal materials.
6. Duct liner.
7. Sealants and gaskets.
8. Hangers and supports.
9. Seismic-restraint devices.
10. Backdraft and pressure relief dampers.
11. Barometric relief dampers.
12. Manual volume dampers.
13. Control dampers.
14. Fire dampers.
15. Smoke dampers.
16. Combination fire and smoke dampers.
17. Turning vanes.
18. Remote damper operators.
19. Duct mounted access doors.
20. Flexible connectors.
21. Flexible ductwork.
22. Antimicrobial coatings
23. UL listed zero clearance kitchen hood exhaust.

##### B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Noise Control" for double wall ductwork.

#### 1.03 PERFORMANCE REQUIREMENTS

- A. Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, latest edition" and performance requirements and design criteria indicated.

##### 1. DESIGN

STATIC PRESSURE  
PRESSURE CLASS  
2 IN. W.G.  
6 IN. W.G.  
10 IN. W.G.

OPERATING PRESSURE  
UP TO 2 IN. W.G.  
OVER 2 IN. UP TO 6 IN. W.G.  
OVER 6 IN. UP TO 10 IN. W.G. or  
as indicated on plans

- a. Based on the following:
  - 1) Single duct system: Static pressure at respective point in ductwork during normal operation.
  - 2) Variable volume duct systems: Static pressure at beginning of fan discharge duct.
- b. Description of ductwork pressure class and equipment:
  - 1) 6" and greater Duct Class: All supply ductwork from discharge of fans, air handling units, or AC units to inlets of terminal boxes on floor, all outdoor ductwork and all ductwork running through unconditioned spaces. Seal Class "A", leakage class 4 (rectangular metal) or Class 3 (round)
  - 2) 6" and greater Duct Class: All return and hood exhaust air ductwork from suction of fans, air handling units or AC units to inlets of terminal boxes on floor. Seal Class "A", leakage class 4 (rectangular metal ) or Class 3 (round)
  - 3) 3" Duct Class: All suction and discharge of kitchen exhaust and other exhaust ductwork. Seal Class "B", leakage class 12 \*rectangular metal or Class 6 (round)
  - 4) 2" Duct Class and less: All other low pressure ductwork. Seal Class "C", leakage Class 24 (rectangular) or Class 12 (round).

- B. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and SEI/ASCE 7.
1. Seismic Hazard Level A: Seismic force to weight ratio, 0.48.
  2. Seismic Hazard Level B: Seismic force to weight ratio, 0.30.
  3. Seismic Hazard Level C: Seismic force to weight ratio, 0.15.

#### 1.04 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings (CAD Generated and Drawn to 3/8 scale):
1. Sheetmetal shop standards shall be compiled directly from the "SMACNA DUCT CONSTRUCTION STANDARDS- Metal and Flexible" manual. Modifications for a specific project, if any, shall be indicated directly on the SMACNA templates. Modified shop standards not taken directly from the SMACNA templates will not be accepted. Any deviations from SMACNA shall be noted.
  2. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
  3. Factory- and shop-fabricated ducts and fittings.
  4. Duct layout (double line) indicating sizes, transitions, configuration, liner material, and static-pressure classes.
  5. Elevation of top of ducts.
  6. Dimensions of main duct runs from building grid lines.

7. Sheet metal thicknesses
  8. Fittings.
  9. Reinforcement details and spacing.
  10. Seam and joint construction and sealing
  11. Materials, fabrication, assembly, and spacing of hangers and supports.
  12. Penetrations through fire-rated and other partitions.
  13. Equipment installation based on equipment being used on Project.
  14. Access clearance for all equipment and accessories
  15. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
  16. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.
  17. Design Calculations: Calculations, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation] for selecting hangers and supports and seismic restraints.
- C. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
  2. Suspended ceiling components.
  3. Structural members to which duct will be attached.
  4. Size and location of initial access modules for acoustical tile.
  5. Penetrations of smoke barriers and fire-rated construction.
  6. Items penetrating finished ceiling including the following:
    - a. Lighting fixtures.
    - b. Air outlets and inlets.
    - c. Speakers.
    - d. Sprinklers.
    - e. Access panels.
    - f. Perimeter moldings.
- D. Welding certificates.
- E. Field quality-control reports.

#### 1.05 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
  2. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- C. NFPA Compliance:
1. NFPA 90A, "Installation of Air conditioning and Ventilating Systems."
  2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
  3. NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations."

- D. Indicate compliance with USGBC LEED rating criteria for Indoor environmental quality (IEQ).

## PART 2 - PRODUCTS

### 2.01 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", latest edition, based on indicated static-pressure class unless otherwisedicated.
- B. The following fitting connections and duct construction gauges are NOT acceptable
  - 1. Drive slip T-1, T-2 fitting connections
  - 2. 26 gauge ductwork.
- C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible." Fittings and/or joints of two different gauges, connected joint rating shall meet more stringent conditions
  - 1. Use the following SMACNA Transverse (Girth) Joints
    - a. Duct construction as follows for 2" w.g. class:
      - 1) Up to 12" wide use T-6 or T-7
      - 2) 13" to 28" wide use T-11 or T12
      - 3) 29" wide and up use TDC or TDF
    - b. Duct construction as follows for 3" w.g. class:
      - 1) Up to 20" wide use T-6 or T-7
      - 2) 21" to 24" wide use T-11 or T12
      - 3) 25" wide and up use TDC or TDF
    - c. Duct construction as follows for 6" w.g. class:
      - 1) Up to 12" wide use T-6 or T-7
      - 2) 13" to 18" wide use T-11 or T12
      - 3) 19" wide and up use TDC or TDF
- D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- E. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

### 2.02 DOUBLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. McGill AirFlow LLC.
  - 2. Sheet Metal Connectors, Inc.



- B. Rectangular Ducts: Fabricate ducts with indicated dimensions for the inner duct.
- C. The following fitting connections and duct construction gauges are NOT acceptable
  - 1. Drive slip T-1, T-2 fitting connections
  - 2. 26 gauge ductwork
- D. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- E. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 1. Use the following SMACNA Transverse (Girth) Joints
    - a. Duct construction as follows for 2" w.g. class:
      - 1) Up to 12" wide use T-6 or T-7
      - 2) 13" to 28" wide use T-11 or T12
      - 3) 29" wide and up use TDC or TDF
    - b. Duct construction as follows for 3" w.g. class:
      - 1) Up to 20" wide use T-6 or T-7
      - 2) 21" to 24" wide use T-11 or T12
      - 3) 25" wide and up use TDC or TDF
    - c. Duct construction as follows for 6" w.g. class:
      - 1) Up to 12" wide use T-6 or T-7
      - 2) 13" to 18" wide use T-11 or T12
      - 3) 19" wide and up use TDC or TDF
- F. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- G. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
  - 1. Maximum Thermal Conductivity: 0.25 Btu x in./h x sq. ft. x deg F (0.034 W/m x K) at 75 deg F (24 deg C) mean temperature.
  - 2. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
  - 3. Coat insulation with antimicrobial coating.
  - 4. Cover insulation with polyester film complying with UL 181, Class 1.
- H. Inner Duct: Minimum 0.028-inch (0.7-mm) perforated galvanized sheet steel having 3/32-inch- (2.4-mm-) diameter perforations, with overall open area of 23 percent.
- I. Formed-on Transverse Joints (Flanges): Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 1. Use the following SMACNA Transverse (Girth) Joints
    - Duct construction as follows for 2" w.g. class:

- 1) Up to 12" wide use T-6 or T-7
    - 2) 13" to 28" wide use T-11 or T12
    - 3) 29" wide and up use TDC or TDF
  - b. Duct construction as follows for 3" w.g. class:
    - 1) Up to 20" wide use T-6 or T-7
    - 2) 21" to 24" wide use T-11 or T12
    - 3) 25" wide and up use TDC or TDF
  - c. Duct construction as follows for 6" w.g. class:
    - 1) Up to 12" wide use T-6 or T-7
    - 2) 13" to 18" wide use T-11 or T12
    - 3) 19" wide and up use TDC or TDF
- J. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

## 2.03 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Lindab Inc.
    - b. McGill AirFlow LLC.
    - c. SEMCO Incorporated.
    - d. Sheet Metal Connectors, Inc.
    - e. Spiral Manufacturing Co., Inc.
- B. Provide spiral seams for all ducts and fittings.
- C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 1. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.
- D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, 1995 edition, Figure 3-2, 2005 edition, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 1. Fabricate round ducts larger than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.
  - 2. Fabricate flat-oval ducts larger than 72 inches (1830 mm) in width (major dimension) with butt-welded longitudinal seams.
- E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," 90 Degree Tees and Laterals," and

"Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

## 2.04 DOUBLE-WALL ROUND DUCTS AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Lindab Inc.
  - 2. McGill AirFlow LLC.
  - 3. SEMCO Incorporated.
  - 4. Sheet Metal Connectors, Inc.
- B. Provide spiral seams for all ducts and fittings
- C. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.
  - 1. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
    - a. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.
  - 2. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
    - a. Fabricate round ducts larger than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.
    - b. Fabricate flat-oval ducts larger than 72 inches (1830 mm) in width (major dimension) with butt-welded longitudinal seams.
  - 3. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," "90 Degree Tees and Laterals," and "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Inner Duct: Minimum 0.028-inch (0.7-mm) perforated galvanized sheet steel having 3/32-inch- (2.4-mm-) diameter perforations, with overall open area of 23 percent.
- E. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
  - 1. Maximum Thermal Conductivity: 0.25 Btu x in./h x sq. ft. x deg F (0.034 W/m x K) at 75 deg F (24 deg C) mean temperature.
  - 2. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
  - 3. Coat insulation with antimicrobial coating.
  - 4. Cover insulation with polyester film complying with UL 181, Class 1.

## 2.05 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible", latest edition for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Exposed Ductwork
  - 1. Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections, including pittings, seam marks, stains, discolorations, and other imperfections. Provide finishes which will allow painting. Provide flat type seams and joints for all exposed duct construction
- C. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
  - 1. Galvanized Coating Designation: G60 (Z180).
  - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- D. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.
- E. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.
- F. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M) Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- G. Factory- or Shop-Applied Antimicrobial Coating:
  - 1. Apply to the interior surface of sheet metal that serve Air Handling Unit's AHU-146 and AHU 147's supply ductwork system an antimicrobial coating that shall form the interior surface of the duct.
  - 2. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
  - 3. Coating containing the antimicrobial compound shall have a hardness of 2H, minimum, when tested according to ASTM D 3363.
  - 4. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
  - 5. Shop-Applied Coating Color: Black.
- H. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
  - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- I. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).
- J. Watertight construction where noted with edges bent 1/2 inch for watertight seal. Longitudinal seam sealant shall be similar to 3M Brand No. 800; Alcoa, aluminastic

Type C, or solder. Stiffeners shall be plug or spot welded. Transverse joints shall be bolted companion angles with 1/4 inch cadmium plated bolts with 6 inch minimum on centers and gasket.

- K. Air tight construction where noted with longitudinal seams soldered. Stiffeners shall be plug or spot welded. Transverse joints shall be bolted companion angle with 1/4 inch cadmium plated bolts with 6 inch minimum on centers and gasket. Exposed, uninsulated ductwork shall be flush flat seam. Provide airtight concrete, masonry and other construction materials for plenums and shafts only where noted
- L. Flush flat seam ductwork: Provide for all exposed uninsulated ducts and transverse joint detail shall be as indicated. Provide sheet metal 2 gauge numbers heavier than required for pressure classification with normal (standing) seam construction. Provide all joints and seams, smooth and aligned with no projections. For internal reinforcing, at transverse joints and on 2 ft centers, provide on ducts 31 inch to 60 inch wide, single vertical stay at duct midpoint, on ducts 61 inch to 90 inch wide provide 2 vertical stays on duct third (1/3) points and for ducts over 90 inch wide provide 3 vertical stays at ducts quarter (1/4) points. For vertical stays: provide 10 USSG galvanized steel, free of burrs and rough edges with both ends bent and fastened to top and bottom of duct.

## 2.06 DUCT LINER

- A. Comply with requirements specified in Division 23 Section "NOISE CONTROL" .
- B. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," "Flexible Duct Liner Installation."
  - 1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
  - 2. Apply adhesive to transverse edges of liner facing upstream. .
  - 3. Butt transverse joints without gaps, and coat joint with adhesive.
  - 4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
  - 5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
  - 6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm (12.7 m/s).
  - 7. Secure liner with mechanical fasteners 4 inches (100 mm) from corners and at intervals not exceeding 12 inches (300 mm) transversely; at 3 inches (75 mm) from transverse joints and at intervals not exceeding 18 inches (450 mm) longitudinally.
  - 8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
    - a. Fan discharges.
    - b. Intervals of lined duct preceding unlined duct.
    - c. Upstream edges of transverse joints in ducts or where indicated.
  - 9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.

- a. Sheet Metal Inner Duct Perforations: 3/32-inch (2.4-mm) diameter, with an overall open area of 23 percent.
10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

## 2.07 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Indicate compliance with USGBC LEED rating criteria for Indoor environmental quality (IEQ)
- C. Two-Part Tape Sealing System:
  1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
  2. Tape Width: 3 inches (76 mm).
  3. Sealant: Modified styrene acrylic.
  4. Water resistant.
  5. Mold and mildew resistant.
  6. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
  7. Service: Indoor and outdoor.
  8. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).
  9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
- D. Water-Based Joint and Seam Sealant:
  1. Application Method: Brush on.
  2. Solids Content: Minimum 65 percent.
  3. Shore A Hardness: Minimum 20.
  4. Water resistant.
  5. Mold and mildew resistant.
  6. VOC: Maximum 75 g/L (less water).
  7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
  8. Service: Indoor or outdoor.
  9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- E. Flanged Joint Sealant: Comply with ASTM C 920.
  1. General: Single-component, acid-curing, silicone, elastomeric.
  2. Type: S.
  3. Grade: NS.
  4. Class: 25.
  5. Use: O.
- F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- G. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m at 250 Pa) and shall be rated for 10-inch wg (2500-Pa) static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

## 2.08 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," "Rectangular Duct Hangers Minimum Size," and "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:
  1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
  2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
  3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

## 2.09 SEISMIC-RESTRAINT DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Cooper B-Line, Inc.; a division of Cooper Industries.
  2. Ductmate Industries, Inc.
  3. Hilti Corp.
  4. Kinetics Noise Control.
  5. Loos & Co.; Cableware Division.
  6. Mason Industries.
  7. TOLCO; a brand of NIBCO INC.
  8. Unistrut Corporation; Tyco International, Ltd.

- B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an evaluation service member of the ICC Evaluation Service.
  - 1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- C. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.
- D. Restraint Cables: ASTM A 603, galvanized-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.
- E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

## 2.10 BACKDRAFT AND PRESSURE RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Greenheck Fan Corporation.
  - 2. Pottorff; a division of PCI Industries, Inc.
  - 3. Ruskin Company.
- B. Description: Gravity balanced.
- C. Maximum Air Velocity: 2000 fpm (10 m/s).
- D. Maximum System Pressure: 2-inch wg (0.5 kPa).
- E. Frame: 0.052-inch- (1.3-mm-) thick, galvanized sheet steel, with welded corners and mounting flange.
- F. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch (150-mm) width, 0.050-inch- (1.2-mm-) thick aluminum sheet with sealed edges.
- G. Blade Action: Parallel.
- H. Blade Seals: Extruded vinyl, mechanically locked.
- I. Blade Axles:
  - 1. Material: Non-metallic.
  - 2. Diameter: 0.20 inch (5 mm).
- J. Tie Bars and Brackets: Aluminum.



- K. Return Spring: Adjustable tension.
- L. Bearings: Synthetic pivot bushings.
- M. Accessories:
  - 1. Counterweights and spring-assist kits for vertical airflow installations.
- N. Sleeve: Minimum 16-gage thickness.

## 2.11 MANUAL VOLUME DAMPERS

- A. Dampers to be the same as duct construction.
- B. Standard, Steel, Manual Volume Dampers:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Pottorff; a division of PCI Industries, Inc.
    - b. Ruskin Company.
  - 2. Standard leakage rating, with linkage outside airstream.
  - 3. Suitable for horizontal or vertical applications.
  - 4. Frames:
    - a. Hat-shaped, galvanized -steel channels, 0.064-inch (1.62-mm) minimum thickness.
    - b. Mitered and welded corners.
    - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
  - 5. Blades:
    - a. Multiple or single blade.
    - b. Provide single blade dampers up to 6 inch width and opposed multiblade dampers above 6 inches in width.
    - c. Parallel- or opposed-blade design.
    - d. Stiffen damper blades for stability.
    - e. Galvanized-steel, 0.064 inch (1.62 mm) thick (16 ga.).
  - 6. Blade Axles: Galvanized steel.
  - 7. Bearings:
    - a. Molded synthetic.
    - b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
  - 8. Tie Bars and Brackets: Galvanized steel.
- C. Standard, Aluminum, Manual Volume Dampers:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Pottorff; a division of PCI Industries, Inc.
    - b. Ruskin Company.
  - 2. Standard leakage rating, with linkage outside airstream.
  - 3. Suitable for horizontal or vertical applications.
  - 4. Frames: Hat-shaped, 0.10-inch- (2.5-mm-) thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
  - 5. Blades:
    - a. Multiple or single blade.

- b. Parallel- or opposed-blade design.
  - c. Stiffen damper blades for stability.
  - d. Roll-Formed Aluminum Blades: 0.10-inch- (2.5-mm-) thick aluminum sheet.
  - e. Extruded-Aluminum Blades: 0.050-inch- (1.2-mm-) thick extruded aluminum.
- 6. Blade Axles: Nonferrous metal.
  - 7. Bearings:
    - a. Molded synthetic.
    - b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
  - 8. Tie Bars and Brackets: Aluminum.
- D. Low-Leakage, Steel, Manual Volume Dampers:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Pottorff; a division of PCI Industries, Inc.
    - b. Ruskin Company.
  - 2. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
  - 3. Suitable for horizontal or vertical applications.
  - 4. Frames:
    - a. Hat shaped.
    - b. Galvanized-steel channels, 0.064 inch (1.62 mm) thick.
    - c. Mitered and welded corners.
    - d. Flanges for attaching to walls and flangeless frames for installing in ducts.
  - 5. Blades:
    - a. Multiple or single blade.
    - b. Parallel- or opposed-blade design.
    - c. Stiffen damper blades for stability.
    - d. Galvanized, roll-formed steel, 0.064 inch (1.62 mm) thick. (16 ga.).
  - 6. Blade Axles: Galvanized steel.
  - 7. Bearings:
    - a. Molded synthetic.
    - b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
  - 8. Blade Seals: Neoprene.
  - 9. Jamb Seals: Cambered aluminum.
  - 10. Tie Bars and Brackets: Galvanized steel.
  - 11. Accessories:
    - a. Include locking device to hold single-blade dampers in a fixed position without vibration.
- E. Low-Leakage, Aluminum, Manual Volume Dampers:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Ruskin Company.
    - b. Trox USA Inc.
  - 2. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.

3. Suitable for horizontal or vertical applications.
4. Frames: Hat-shaped, 0.10-inch- (2.5-mm-) thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:
  - a. Multiple or single blade.
  - b. Parallel- or opposed-blade design.
  - c. Roll-Formed Aluminum Blades: 0.10-inch- (2.5-mm-) thick aluminum sheet.
  - d. Extruded-Aluminum Blades: 0.050-inch- (1.2-mm-) thick extruded aluminum.
6. Blade Axles: Stainless steel.
7. Bearings:
  - a. Molded synthetic.
  - b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Blade Seals: Neoprene.
9. Jamb Seals: Cambered aluminum.
10. Tie Bars and Brackets: Aluminum.
11. Accessories:
  - a. Include locking device to hold single-blade dampers in a fixed position without vibration.

F. Jackshaft:

1. Size: 1-inch (25-mm) diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

G. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

## 2.11 CONTROL DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Greenheck Fan Corporation.
  2. Ruskin Company.
- B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage. All dampers serving outside air connections/service shall be internal insulated type.
- C. Dampers to be the same as duct construction.
- D. For internally lined ductwork: Provide 2 internal saddles to protect lining.
- E. Frames:
  1. Hat shaped.

2. Galvanized-steel channels, 0.064 inch (1.62 mm) thick.
  3. Mitered and welded corners.
- F. Blades:
1. Provide airfoil blades.
  2. Multiple blade with maximum blade width of 8 inches (200 mm).
  3. Provide dampers with parallel blades for 2 position control and opposed blades for modulating control.
  4. Parallel- and opposed-blade design.
  5. Galvanized steel.
  6. 0.064 inch (1.62 mm) thick.
  7. Blade Edging: Closed-cell neoprene edging.
  8. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.
- G. Blade Axles: 1/2-inch- (13-mm-) diameter; nonferrous metal; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.
1. Operating Temperature Range: From minus 40 to plus 200 deg F (minus 40 to plus 93 deg C).
- H. Bearings:
1. Molded synthetic.
  2. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
  3. Thrust bearings at each end of every blade.

## 2.12 FIRE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Pottorff; a division of PCI Industries, Inc.
  2. Ruskin Company.
- B. Type: Dynamic; rated and labeled according to UL 555 by an NRTL.
- C. Closing rating in ducts up to 4-inch wg (1-kPa) static pressure class and minimum 4000-fpm (20-m/s) velocity.
- D. Fire Rating: 1-1/2 and 3 hours.
- E. Frame: Curtain type with blades outside airstream ("Type B"); fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.
- F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
1. Minimum Thickness: 0.052 or 0.138 inch (1.3 or 3.5 mm) thick, as indicated, and of length to suit application.
  2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
- G. Mounting Orientation: Vertical or horizontal as indicated.

- H. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized-steel blade connectors.
- I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- J. Heat-Responsive Device: Replaceable, 165 deg F (74 deg C) rated, fusible links.
- K. Provide fire dampers as noted on the plans and in ducts and openings in the following:
  - 1. Floors.
  - 2. Fire walls.
  - 3. Fire-resistance partitions.
  - 4. Fire rated ceilings.
  - 5. Exit corridor walls.
- L. Provide access door in duct adjacent to each fire damper.

## 2.13 LOUVERS

- A. Provide intake louver by Ruskin or approved equal.
- B. Louver shall be horizontal chevron 16 gauge aluminum blades in 12 gauge aluminum frame. Louver shall be demountable so that complete blade assembly may be removed from frame. 1/2" square mesh galvanized screen shall be furnished on interior side of louver. Color shall be as selected by Architect.

## 2.14 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Ductmate Industries, Inc.
  - 2. Duro Dyne Inc.
  - 3. METALAIRE, Inc.
  - 4. SEMCO Incorporated.
- B. Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
  - 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; "Vanes and Vane Runners," and "Vane Support in Elbows."
- D. Vane Construction: Double wall.
- E. The maximum unsupported vane length shall not exceed 48 inches.
- F. Single vane and short radius vanes are not acceptable.

## 2.15 REMOTE DAMPER OPERATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Pottorff; a division of PCI Industries, Inc.
  - 2. Ventfabrics, Inc.
  - 3. Young Regulator Company.
- B. Description: Cable system designed for remote manual damper adjustment.
- C. Tubing: Brass.
- D. Cable: Stainless steel.
- E. Wall-Box Mounting: Recessed, 3/4 inches (19 mm) deep Surface.
- F. Wall-Box Cover-Plate Material: Steel.

## 2.16 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Ductmate Industries, Inc.
  - 2. Greenheck Fan Corporation.
  - 3. McGill AirFlow LLC.
  - 4. Pottorff; a division of PCI Industries, Inc.
  - 5. Ventfabrics, Inc.
- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."
  - 1. Door:
    - a. Double wall, rectangular.
    - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
    - c. Vision panel.
    - d. Hinges and Latches: 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.
    - e. Fabricate doors airtight and suitable for duct pressure class.
  - 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
  - 3. Number of Hinges and Locks:
    - a. Access Doors Less Than 12 Inches (300 mm) Square: No hinges and two sash locks.
    - b. Access Doors up to 18 Inches (460 mm) Square: Two hinges and two sash locks.
    - c. Access Doors up to 24 by 48 Inches (600 by 1200 mm): Three hinges and two compression latches with outside and inside handles.
    - d. Access Doors Larger Than 24 by 48 Inches (600 by 1200 mm): Four hinges and two compression latches with outside and inside handles.
- C. Furnish and install gasketed grease tight access doors on the grease hood exhaust duct as required under NFPA 96.

## 2.17 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Ductmate Industries, Inc.
  - 2. Duro Dyne Inc.
  - 3. Ventfabrics, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches (89 mm) wide attached to 2 strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
  - 1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
  - 2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
  - 3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).
- F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
  - 1. Minimum Weight: 24 oz./sq. yd. (810 g/sq. m).
  - 2. Tensile Strength: 530 lbf/inch (93 N/mm) in the warp and 440 lbf/inch (77 N/mm) in the filling.
  - 3. Service Temperature: Minus 50 to plus 250 deg F (Minus 45 to plus 121 deg C).
- G. High-Temperature System, Flexible Connectors: Glass fabric coated with silicone rubber.
  - 1. Minimum Weight: 16 oz./sq. yd. (542 g/sq. m).
  - 2. Tensile Strength: 285 lbf/inch (50 N/mm) in the warp and 185 lbf/inch (32 N/mm) in the filling.
  - 3. Service Temperature: Minus 67 to plus 500 deg F (Minus 55 to plus 260 deg C).
- H. High-Corrosive-Environment System, Flexible Connectors: Glass fabric with chemical-resistant coating.
  - 1. Minimum Weight: 14 oz./sq. yd. (474 g/sq. m).
  - 2. Tensile Strength: 450 lbf/inch (79 N/mm) in the warp and 340 lbf/inch (60 N/mm) in the filling.
  - 3. Service Temperature: Minus 67 to plus 500 deg F (Minus 55 to plus 260 deg C).
- I. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
  - 1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
  - 2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
  - 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
  - 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.

5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch (6-mm) movement at start and stop.

## 2.18 FLEXIBLE DUCTWORK

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Buckley Associates
  2. Novaflex
- B. Construction
  1. Flex duct shall comply with UL 181, Class 1.
  2. Flex duct shall be Type 4, with a heavy coated fiberglass cloth fabric liner, mechanically locked without adhesives. Helix shall be corrosive resistant galvanized steel formed and mechanically locked to fabric.
  3. For duct systems requiring insulation, the flex duct shall have 1 inch thick fiberglass insulation blanket encapsulated in a fire retardant polyethylene outer jacket with a flame spread less than 25 and smoke developed rating less than 50

## PART 3 - EXECUTION

### 3.01 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round and flat-oval ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.



- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."
- M. Flexible duct runouts to diffusers/registers/grilles shall not exceed six feet in length, fully extended.
- N. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- O. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- P. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
  - 1. Provide manual balancing volume dampers as required properly balance the air distribution system. If the location of balancing dampers are not defined on the drawings, the following minimum standards shall govern:
    - a. Low Pressure: All supply main air branches from trunk, each split, and all sub branches from main shall be provided with balancing dampers.
    - b. Low Pressure: All exhaust main air branches from trunk, each split, and all sub branches from main shall be provided with balancing dampers.
    - c. Medium Pressure: All branches and takeoffs downstream of terminal boxes (CV, VAV and FPB) shall be provided with low leakage balancing dampers.
    - d. Ducts connecting to common plenums.
    - e. Ducts serving single outlet.
    - f. At open return duct in hung ceiling.
    - g. As noted on plans.
  - 2. For internally lined ductwork: Provide 2 internal saddles to protect lining.
  - 3. Install levers to be accessible through the insulation
- Q. Set dampers to fully open position before testing, adjusting, and balancing.
- R. Install test holes at fan inlets and outlets and elsewhere as indicated.
- S. Install, combination fire & smoke fire and smoke dampers according to UL listing.
- T. Connect ducts to duct silencers rigidly.
- U. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
  - 1. On both sides of duct coils.
  - 2. Downstream from manual volume dampers, control dampers, turning vanes, and equipment.

3. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
  4. At each change in direction and at maximum 50-foot (15-m) spacing.
  5. Upstream of turning vanes.
  6. Elsewhere as indicated.
- V. Install access doors with swing against duct static pressure.
- W. Access Door Sizes:
1. One-Hand or Inspection Access: 8 by 5 inches.
  2. Two-Hand Access: 12 by 6 inches.
  3. Head and Hand Access: 18 by 10 inches.
  4. Head and Shoulders Access: 21 by 14 inches.
  5. Body Access: 25 by 14 inches.
  6. Body plus Ladder Access: 25 by 17 inches.
- X. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- Y. Install flexible connectors to connect ducts to equipment.
- Z. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- AA. Connect terminal units to supply ducts directly. Do not use flexible ducts provide flexible connections for all fan powered terminal boxes.
- BB. Connect diffusers to flexible ducts with draw bands.
- CC. Install duct test holes where required for testing and balancing purposes.
- DD. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch (6-mm) movement during start and stop of fans.

### 3.02 SEAM AND JOINT SEALING

- A. Seal duct seams and joints for duct static-pressure and leakage classes specified in "Performance Requirements" Article, according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Standard Duct Sealing Requirements," unless otherwise indicated..

### 3.03 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
  1. Where practical, install concrete inserts before placing concrete.
  2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.

3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
  4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
  5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with the requirements of this section, the BUILDING CODE and SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," "Rectangular Duct Hangers Minimum Size," and "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing whichever is more stringent. Install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- G. Hangers, horizontal ducts:
1. To 2 sq ft in area: Provide galvanized steel strap hangers, minimum 1 inch x 1/8 inch, maximum 8 ft - 0 inch spacing.
  2. 2 to 4 sq ft in area: Galvanized steel strap hangers, minimum 1 inch x 1/8 inch, maximum 8 ft 0 inch spacing.
  3. Strap hangers shall be bent 2 inch under the bottom corner of rectangular ducts. One screw shall secure 2 inch portion of hanger to bottom of duct. Straps shall be secured to side of duct with a minimum of two screws and more, as necessary, to provide a maximum screw spacing of 12 inch. Side-of-duct screws shall be located not more than 2 inch from top and bottom of duct.
  4. 4 to 10 sq ft in area: Provide galvanized steel trapeze angles from steel threaded rods with a maximum 6 ft - 0 inch spacing.
  5. Over 10 sq ft in area: Provide galvanized steel trapeze angles from steel threaded rods with a maximum 4 ft - 0 inch spacing.
  6. Provide stronger support to match larger and heavier ducts; provide cross-bracing, angle iron hangers, as required for rigid and adequate supports.
  7. In mechanical rooms: Provide black steel painted or galvanized, vertical angles or rods and horizontal angles across ductwork.
  8. Kitchen exhaust in accordance with NFPA 96.
- H. Hangers Vertical ducts: At each floor, provide minimum 2 supports per duct fastened to duct and spanning shaft opening. Fasten supports to floor or structural construction. Maximum screw spacing shall be 12 inch on center and maximum shall be four screw per riser.
1. Angles and channels: Provide painted black steel or galvanized. Where angles are specified, channels of equivalent strength, material and protective coating will be permitted. Where more than one duct is supported by a common set of angles, support size shall be determined by sum of width dimensions.
  2. Supports: Provide as follows, except increase supports as required for load and span where span of angles exceed 6 ft or floor-to-floor height exceeds 14 ft.

- a. Duct width to 30 inch: Provide angle size: 1-1/4 inch x 1-1/4 inch x 1/8 inch.
  - b. Duct width, 31 inch to 54 inch: Angle size shall be 2 inch x 2 inch x 3/16 inch.
  - c. Duct width, 55 inch to 90 inch: Angle size shall be 2 inch x 2 inch x 1/4 inch.
3. Vertical kitchen exhaust, fireproofed and plastered ducts: Provide minimum 3 inch, 4.1 lb/ft, steel channels fastened to slab, welded to building structural steel or as acceptable. Supports shall be bolted or welded to ducts and in accordance with NFPA 96.

### 3.04 SEISMIC-RESTRAINT-DEVICE INSTALLATION

- A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems." SEI/ASCE 7.
  - 1. Space lateral supports a maximum of 40 feet (12 m) o.c., and longitudinal supports a maximum of 80 feet (24 m) o.c.
  - 2. Brace a change of direction longer than 12 feet (3.7 m).
- B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install cable restraints on ducts that are suspended with vibration isolators.
- E. Install seismic-restraint devices using methods approved by an evaluation service member of the ICC Evaluation Service.
- F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.
- G. Drilling for and Setting Anchors:
  - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
  - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
  - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
  - 4. Set anchors to manufacturer's recommended torque, using a torque wrench.
  - 5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

### 3.05 CONNECTIONS

- A. Make connections to equipment with flexible connectors.
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

### 3.06 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
  - 1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual."
  - 2. All testing shall be done in the presence of the engineer or owner's representative. The contractor is responsible for providing all collars, caps, electric power, etc. necessary to perform the tests. The contractor is also responsible for scheduling the test no less than three (3) business days prior to its intended occurrence. Low pressure ductwork (2" class) shall be tested on an as needed basis at the engineer's direction. Leakage test procedure shall follow the outlines and classifications in the SMACNA HVAC duct leakage test manual. If specimen fails to meet allotted leakage level, the contractor shall modify to bring it into compliance and shall retest it until acceptable leakage is demonstrated. Tests and necessary repair shall be completed prior to concealment of ducts.
  - 3. Test the following systems:
    - a. All ductwork greater than 2" class as defined within is to be tested. .
  - 4. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
  - 5. Test for leaks before insulation application.
  - 6. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.
- C. Duct System Cleanliness Tests:
  - 1. Visually inspect duct system to ensure that no visible contaminants are present.
  - 2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
    - a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.
- D. Duct system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

### 3.07 DUCT CLEANING

- A. Clean new duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer.
  2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
  3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Particulate Collection and Odor Control:
1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
  2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- D. Clean the following components by removing surface contaminants and deposits:
1. Air outlets and inlets (registers, grilles, and diffusers).
  2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
  3. Air-handling unit internal surfaces and components including mixing box, coil section, condensate drain pans, humidifiers, filters and filter sections, and condensate collectors and drains.
  4. Coils and related components.
  5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
  6. Supply-air ducts, dampers, actuators, and turning vanes.
  7. Dedicated exhaust and ventilation components and makeup air systems.
- E. Mechanical Cleaning Methodology:
1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
  2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
  3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
  4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
  5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
  6. Provide drainage and cleanup for wash-down procedures.
  7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

### 3.08 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as follows:
- B. Exposed ductwork:

1. Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections, including pittings, seam marks, stains, discolorations, and other imperfections. Provide finishes which will allow painting. Provide flat type seams and joints for all exposed duct construction
  2. Watertight Ductwork exposed to weather, except as noted shall be as follows:
    - a. Aluminum.
    - b. Watertight.
  3. Outside air, exhaust and relief duct shall be as follows:
    - a. Aluminum.
    - b. Watertight.
    - c. Extent:
      - 1) Within 10 ft. of louvers.
  4. Ductwork at duct humidifiers shall be as follows:
    - a. Aluminum.
    - b. Watertight.
    - c. Minimum 2 ft. upstream.
    - d. Minimum 10 ft downstream.
  5. Sub Sterile Exhaust Ductwork, provide as follows:
    - a. 316 Stainless Steel.
    - b. Welded.
    - c. Construction shall be in accordance with SMACNA rectangular industrial duct construction standards.
  6. Canopy fume hoods shall be as follows:
    - a. ACGIH Industrial Ventilation Manual, unless noted otherwise.
    - b. Stainless steel No. 16 USSG.
    - c. Internal angles and seams.
    - d. Bolts shall be countersunk.
    - e. Size, configuration and support shall be as indicated.
- C. Liner:
1. Comply with requirements specified in Division 23 Section 'NOISE CONTROL' .
- D. Double-Wall Duct Interstitial Insulation / acoustic lining:
1. Supply- and Return-Air Ducts, 1 inch thick.
- E. Elbow Configuration:
1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Rectangular Elbows."
    - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
    - 2) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Vanes and Vane Runners," and "Vane Support in Elbows."
    - 3) Provide splitter vanes on all short radius elbows.
    - 4) Provide double thickness turning vanes on all square elbows.
  2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," "Round Duct Elbows."
    - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible,"

Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments, conform to SMACNA.

- 1) Velocity 1000 fpm or Lower: 0.6 radius-to-diameter ratio and three segments for 90-degree elbow.
  - 2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
  - 3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
- b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
  - c. Round Elbows, 14 Inches and Larger in Diameter: Welded.

F. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," "Branch Connections."
  - a. Rectangular Main to Rectangular Branch: 45-degree entry.
  - b. Rectangular Main to Round Branch: flanged spin in, conical.
  - c. Do not use "butt flange" straight taps.
  - d. Divided flow branches
    - 1) Provide long radius takeoff or square elbow as per SMACNA.
2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," "90 Degree Tees and Laterals," and "Conical Tees."
  - a. Velocity 1000 fpm or Lower: 90-degree tee fitting.
  - b. Velocity 1000 to 1500 fpm: Conical fitting.
  - c. Velocity 1500 fpm or Higher: 45-degree lateral fitting.
  - d. Saddle taps are NOT permitted.
  - e. No bull head tees
  - f. Divided flow branches, conical tees, y- branch or reducing Y-branch.or Tee's

G. Obstructions

1. Conform to SMACNA

H. Offsets and transitions

1. Conform to SMACNA

END OF SECTION



## SECTION 23 33 00

### Air Duct Accessories

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. Section Includes:
  - 1. Backdraft and pressure relief dampers.
  - 2. Barometric relief dampers.
  - 3. Manual volume dampers.
  - 4. Control dampers.
  - 5. Fire dampers.
  - 6. Ceiling dampers.
  - 7. Smoke dampers.
  - 8. Combination fire and smoke dampers.
  - 9. Corridor dampers.
  - 10. Flange connectors.
  - 11. Turning vanes.
  - 12. Remote damper operators.
  - 13. Duct-mounted access doors.
  - 14. Flexible connectors.
  - 15. Duct security bars.
  - 16. Duct accessory hardware.
- B. Related Sections:
  - 1. Division 23 Section "HVAC Gravity Ventilators" for roof-mounted ventilator caps.
  - 2. Division 28 Section "Fire Detection and Alarm" for duct-mounted fire and smoke detectors.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
  - 1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.
- B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
  - 1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
    - a. Special fittings.

- b. Manual volume damper installations.
  - c. Control damper installations.
  - d. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
  - e. Duct security bars.
  - f. Wiring Diagrams: For power, signal, and control wiring.
- C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.
  - D. Source quality-control reports.
  - E. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.
- 1.4 QUALITY ASSURANCE
- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
  - B. Comply with AMCA 500-D testing for damper rating.
- 1.5 EXTRA MATERIALS
- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
    - 1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
  - 1. Galvanized Coating Designation: G60 (Z180).
  - 2. Exposed-Surface Finish: Mill phosphatized.
- C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2D finish for concealed ducts and No 4 finish for exposed ducts.
- D. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- E. Extruded Aluminum: Comply with ASTM B 221 (ASTM B 221M), Alloy 6063, Temper T6.

- F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- G. Tie Rods: Galvanized steel, **1/4-inch (6-mm)** minimum diameter for lengths **36 inches (900 mm)** or less; **3/8-inch (10-mm)** minimum diameter for lengths longer than **36 inches (900 mm)**.

## 2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Greenheck Fan Corporation.
  2. Pottorff; a division of PCI Industries, Inc.
  3. Ruskin Company.
- B. Description: Gravity balanced.
- C. Maximum Air Velocity: **2000 fpm (10 m/s)**
- D. Maximum System Pressure: **2-inch wg (0.5 kPa)**
- E. Frame: **0.052-inch- (1.3-mm-)** thick, galvanized sheet steel with welded corners and mounting flange.
- F. Blades: Multiple single-piece blades, center-pivoted, maximum **6-inch (150-mm)** width, **0.050-inch- (1.2-mm-)** thick aluminum sheet noncombustible, tear-resistant, neoprene-coated fiberglass with sealed edges.
- G. Blade Action: Parallel.
- H. Blade Seals: Neoprene, mechanically locked.
- I. Blade Axles:
  1. Material: Stainless steel
  2. Diameter: **0.20 inch (5 mm)**
- J. Tie Bars and Brackets: Aluminum
- K. Return Spring: Adjustable tension.
- L. Bearings: Synthetic pivot bushings.
- M. Accessories:
  1. Adjustment device to permit setting for varying differential static pressure.
  2. Counterweights and spring-assist kits for vertical airflow installations.
  3. Electric actuators.
  4. Chain pulls.
  5. Front of rear screens.
  6. 90-degree stops.
- N. Sleeve: Minimum **16-gage** thickness.

## 2.3 BAROMETRIC RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Greenheck Fan Corporation.

2. Pottorff; a division of PCI Industries, Inc.
  3. Ruskin Company.
- B. Suitable for horizontal or vertical mounting.
- C. Maximum Air Velocity: 2000 fpm (10 m/s)
- D. Maximum System Pressure: 2-inch wg (0.5 kPa)
- E. Frame: 0.064-inch- (1.6-mm-) thick, galvanized sheet steel with welded corners and mounting flange.
- F. Blades:
1. Multiple, 0.050-inch- (1.2-mm-) thick aluminum sheet.
  2. Maximum Width: 6 inches (150 mm).
  3. Action: Parallel.
  4. Balance: Gravity.
  5. Eccentrically pivoted.
- G. Blade Seals: Neoprene.
- H. Blade Axles: Nonferrous metal.
- I. Tie Bars and Brackets:
1. Material: Aluminum
  2. Rattle free with 90-degree stop.
- J. Return Spring: Adjustable tension.
- K. Bearings: Synthetic
- L. Accessories:
1. Flange on intake.
  2. Adjustment device to permit setting for varying differential static pressures.

## 2.4 MANUAL VOLUME DAMPERS

- A. Dampers to be the same as duct construction.
- B. Standard, Steel, Manual Volume Dampers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Pottorff; a division of PCI Industries, Inc.
    - b. Ruskin Company.
  2. Standard leakage rating, with linkage outside airstream.
  3. Suitable for horizontal or vertical applications.
  4. Frames:
    - a. Hat-shaped, galvanized -steel channels, 0.064-inch (1.62-mm) minimum thickness.
    - b. Mitered and welded corners.
    - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
  5. Blades:
    - a. Multiple or single blade.
    - b. Provide single blade dampers up to 6 inch width and opposed multiblade dampers above 6 inches in width.
    - c. Parallel- or opposed-blade design.
    - d. Stiffen damper blades for stability.

- e. Galvanized -steel, 0.064 inch (1.62 mm) thick (16 ga.).
  - 6. Blade Axles: Galvanized steel.
  - 7. Bearings:
    - a. Molded synthetic.
    - b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
  - 8. Tie Bars and Brackets: Galvanized steel.
- C. Standard, Aluminum, Manual Volume Dampers:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Pottorff; a division of PCI Industries, Inc.
    - b. Ruskin Company.
  - 2. Standard leakage rating, with linkage outside airstream.
  - 3. Suitable for horizontal or vertical applications.
  - 4. Frames: Hat-shaped, 0.10-inch- (2.5-mm-) thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
  - 5. Blades:
    - a. Multiple or single blade.
    - b. Parallel- or opposed-blade design.
    - c. Stiffen damper blades for stability.
    - d. Extruded-Aluminum Blades: 0.050-inch- (1.2-mm-) thick extruded aluminum.
  - 6. Blade Axles: Nonferrous metal.
  - 7. Bearings:
    - a. Molded synthetic.
    - b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
  - 8. Tie Bars and Brackets: Aluminum.
- D. Low-Leakage, Steel, Manual Volume Dampers:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Pottorff; a division of PCI Industries, Inc.
    - b. Ruskin Company.
  - 2. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
  - 3. Suitable for horizontal or vertical applications.
  - 4. Frames:
    - a. Hat shaped.
    - b. Galvanized -steel channels, 0.064 inch (1.62 mm) thick.
    - c. Mitered and welded corners.
    - d. Flanges for attaching to walls and flangeless frames for installing in ducts.
  - 5. Blades:
    - a. Multiple or single blade.
    - b. Parallel- or opposed-blade design.
    - c. Stiffen damper blades for stability.
    - d. Galvanized, roll-formed steel, 0.064 inch (1.62 mm) thick. (16 ga.).
  - 6. Blade Axles: Nonferrous metal.

7. Bearings:
    - a. Molded synthetic.
    - b. Dampers in ducts with pressure classes of **3-inch wg (750 Pa)** or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
  8. Blade Seals: Neoprene.
  9. Jamb Seals: Cambered aluminum.
  10. Tie Bars and Brackets: Galvanized steel.
  11. Accessories:
    - a. Include locking device to hold single-blade dampers in a fixed position without vibration.
- E. Low-Leakage, Aluminum, Manual Volume Dampers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Ruskin Company.
    - b. Trox USA Inc.
  2. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
  3. Suitable for horizontal or vertical applications.
  4. Frames: Hat -shaped, **0.10-inch- (2.5-mm-)** thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
  5. Blades:
    - a. Multiple or single blade.
    - b. Parallel- or opposed-blade design.
    - c. Extruded-Aluminum Blades: **0.050-inch- (1.2-mm-)** thick extruded aluminum.
  6. Blade Axles: Stainless steel.
  7. Bearings:
    - Molded synthetic.
    - a. Dampers in ducts with pressure classes of **3-inch wg (750 Pa)** or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
  8. Blade Seals: Neoprene.
  9. Jamb Seals: Cambered aluminum.
  10. Tie Bars and Brackets: Aluminum.
  11. Accessories:
    - a. Include locking device to hold single-blade dampers in a fixed position without vibration.
- F. Jackshaft:
1. Size: **1-inch (25-mm)** diameter.
  2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
  3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.
- G. Damper Hardware:
1. Zinc-plated, die-cast core with dial and handle made of **3/32-inch- (2.4-mm-)** thick zinc-plated steel, and a **3/4-inch (19-mm)** hexagon locking nut.
  2. Include center hole to suit damper operating-rod size.

3. Include elevated platform for insulated duct mounting.

## 2.5 CONTROL DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Greenheck Fan Corporation.
  2. Ruskin Company.
- B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
- C. Dampers to be the same as duct construction.
- D. For internally lined ductwork: Provide 2 internal saddles to protect lining.
- E. Frames:
  1. Hat shaped.
  2. Galvanized -steel channels, 0.064 inch (1.62 mm) thick.
  3. Mitered and welded corners.
- F. Blades:
  1. Provide airfoil blades.
  2. Multiple blade with maximum blade width of 8 inches (200 mm).
  3. Provide dampers with parallel blades for 2 position control and opposed blades for modulating control.
  4. Parallel- and opposed blade design.
  5. Galvanized steel.
  6. 0.064 inch (1.62 mm) thick.
  7. Blade Edging: Closed-cell neoprene edging.
- G. Blade Axles: 1/2-inch- (13-mm-) diameter; nonferrous metal; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.
  1. Operating Temperature Range: From minus 40 to plus 200 deg F (minus 40 to plus 93 deg C).
- H. Bearings:
  1. Molded synthetic.
  2. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
  3. Thrust bearings at each end of every blade.

## 2.6 FIRE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Pottorff; a division of PCI Industries, Inc.
  2. Ruskin Company.
- B. Type: Dynamic; rated and labeled according to UL 555 by an NRTL.
- C. Closing rating in ducts up to 4-inch wg (1-kPa) static pressure class and minimum 4000-fpm (20-m/s) velocity.
- D. Dampers shall contain a NYC MEA# and be approved for use in NYC.
- E. Fire Rating: 1-1/2 hours.

- F. Frame: Curtain type with blades outside airstream ("Type B"); fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.
- G. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
  - 1. Minimum Thickness: 0.052 or 0.138 inch (1.3 or 3.5 mm) thick, as indicated, and of length to suit application.
  - 2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
- H. Mounting Orientation: Vertical or horizontal as indicated.
- I. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized-steel blade connectors.
- J. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- K. Heat-Responsive Device: Replaceable, 165 deg F (74 deg C) rated, fusible links.
- L. Heat-Responsive Device: Electric resettable link and switch package, factory installed, 165 deg F (74 deg C) rated.
- M. The HVAC contractor shall provide all devices, relays, end switches, e/p switches, control components, air piping, power wiring, control wiring and interlock wiring as required to accomplish the sequence of operation for these dampers.
- N. Provide fire dampers as noted on the plans and in ducts and openings in the following:
  - 1. Shafts.
  - 2. Floors.
  - 3. Fire walls.
  - 4. Fire-resistance partitions.
  - 5. Fire rated ceilings.
  - 6. Exit corridor walls.
- O. Provide access door in duct adjacent to each fire damper.

## 2.7 CEILING DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Ruskin Company.
  - 2. Pottorff; a division of PCI Industries, Inc.
- B. General Requirements:
  - 1. Labeled according to UL 555C by an NRTL.
  - 2. Comply with construction details for tested floor- and roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."
- C. Frame: Galvanized sheet steel, round or rectangular, style to suit ceiling construction.
- D. Blades: Galvanized sheet steel with refractory insulation.
- E. Heat-Responsive Device: Replaceable, 165 deg F (74 deg C) rated, fusible links.
- F. Fire Rating: 2 hours.



## 2.8 SMOKE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Ruskin Company.
  - 2. Pottorff; a division of PCI Industries, Inc.
- B. General Requirements: Label according to UL 555S by an NRTL.
- C. Frame: Multiple blade type; fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.
- D. Blades: Airfoil type Roll-formed, horizontal, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized-steel blade connectors.
- E. Leakage: Class I .
- F. Rated pressure and velocity to exceed design airflow conditions.
- G. Mounting Sleeve: Factory-installed, 0.052-inch- (1.3-mm-) thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone caulking.
- H. Provide motor mount bracket strengthener for dampers over 10" in height.
- I. Provide a 10 gauge welded vertical stiffener at each corner to prevent damper misalignment.
- J. Damper Motors: Modulating or two-position action.
- K. Actuators mounted out of the air stream,
- L. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
  - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
  - 2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 23 Section "Instrumentation and Control for HVAC."
  - 3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
  - 4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 150 in. x lbf (17 N x m).
  - 5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F (minus 40 deg C).
  - 6. Electrical Connection: 115 V, single phase, 60 Hz.
- M. Accessories:
  - 1. Auxiliary switches for position indication.
  - 2. Test and reset switches, remotemounted.
- N. The HVAC contractor shall provide all devices, relays, end switches, e/p switches, control components, air piping, power wiring, control wiring and interlock wiring as required to accomplish the sequence of operation for these dampers.

- O. Provide access door in duct adjacent to each combination fire / smoke damper.

## 2.9 COMBINATION FIRE AND SMOKE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Pottorff; a division of PCI Industries, Inc., model FSD-151, FSD-341, 1-1/2 or 3 hours rated as applicable
  - 2. Ruskin Company.model FSD-60, 1-1/2 or 3 hour rated as applicable
- B. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL.
- C. Closing rating in ducts up to [4-inch wg static pressure class and minimum 4000-fpm (20-m/s) velocity.
- D. Fire Rating: 1-1/2 hours.
- E. Frame: multiblade type fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.
- F. Heat-Responsive Device: Electric resettable link and switch package, factory installed, rated. Provide dual temperature heat responsive device.
- G. Blades: 14 gauge galvanized airfoil shaped double skin, single piece construction, maximum 6 inches wide..
- H. Leakage: Class I .
- I. Rated pressure and velocity to exceed design airflow conditions.
- J. Mounting Sleeve: Factory-installed, 0.052-inch- (1.3-mm-) thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone caulking.
- K. Provide motor mount bracket strengthener for dampers over 10" in height.
- L. Provide a 10 gauge welded vertical stiffener at each corner to prevent damper misalignment
- M. Master control panel for use in dynamic smoke-management systems.
- N. Damper Motors: Modulating or two-position action.
- O. Actuators mounted out of the air stream,
- P. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
  - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
  - 2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 23 Section "Instrumentation and Control for HVAC."
  - 3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
  - 4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 150 in. x lbf (17 N x m).

5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F (minus 40 deg C).
6. Electrical Connection: 115 V, single phase, 60 Hz.

Q. Accessories:

1. Auxiliary switches for position indication. Multiple damper sections that are part of the same damper can be wired in series as one large damper indicator.
2. Test and reset switches, remote mounted.

R. The HVAC contractor shall provide all devices, relays, end switches, e/p switches, control components, air piping, power wiring, control wiring and interlock wiring as required to accomplish the sequence of operation for these dampers.

S. Provide combination fire / smoke dampers as noted on the plans and in ducts and openings in the following:

1. Shafts.
2. Floors.
3. Fire walls.
4. Fire-resistance partitions.
5. Fire rated ceilings.
6. Exit corridor walls.

T. Provide access door in duct adjacent to each combination fire / smoke damper.

## 2.10 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. METALAIR, Inc.
4. SEMCO Incorporated.

B. Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; "Vanes and Vane Runners," and "Vane Support in Elbows."

D. Vane Construction: Double wall.

E. The maximum unsupported vane length shall not exceed 48 inches.

F. Single vane and short radius vanes are not acceptable.

## 2.11 REMOTE DAMPER OPERATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pottorff; a division of PCI Industries, Inc.
2. Ventfabrics, Inc.
3. Young Regulator Company.

- B. Description: Cable system designed for remote manual damper adjustment.
- C. Tubing: Brass.
- D. Cable: Stainless steel.
- E. Wall-Box Mounting: Recessed, 3/4 inches (19 mm) deep
- F. Wall-Box Cover-Plate Material: Stainless steel.

## 2.12 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Ductmate Industries, Inc.
  - 2. Greenheck Fan Corporation.
  - 3. McGill AirFlow LLC.
  - 4. Pottorff; a division of PCI Industries, Inc.
  - 5. Ventfabrics, Inc.
- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."
  - 1. Door:
    - a. Double wall, rectangular.
    - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
    - c. Vision panel.
    - d. Hinges and Latches: 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.
    - e. Fabricate doors airtight and suitable for duct pressure class.
  - 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
  - 3. Number of Hinges and Locks:
    - a. Access Doors Less Than 12 Inches (300 mm) Square: No hinges and two sash locks.
    - b. Access Doors up to 18 Inches (460 mm) Square: Two hinges and two sash locks.
    - c. Access Doors up to 24 by 48 Inches (600 by 1200 mm): Three hinges and two compression latches with outside handles
    - d. Access Doors Larger Than 24 by 48 Inches (600 by 1200 mm): Four hinges and two compression latches with outside and inside handles.
- C. Pressure Relief Access Door:
  - 1. Door and Frame Material: Galvanized sheet steel.
  - 2. Door: Double wall with insulation fill with metal thickness applicable for duct pressure class.
  - 3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
  - 4. Factory set at 10-inch wg (2500 Pa)
  - 5. Doors close when pressures are within set-point range.
  - 6. Hinge: Continuous piano.
  - 7. Latches: Cam.
  - 8. Seal: Neoprene or foam rubber.
  - 9. Insulation Fill: 1-inch- (25-mm-) thick, fibrous-glass or polystyrene-foam board.

## 2.13 DUCT ACCESS PANEL ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following
  - 1. Ductmate Industries, Inc.
  - 2. Flame Gard, Inc.
  - 3. 3M.
- B. Labeled according to UL 1978 by an NRTL.
- C. Panel and Frame: Minimum thickness **0.0428-inch (1.1-mm)** stainless steel.
- D. Fasteners: Stainless steel. Panel fasteners shall not penetrate duct wall.
- E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum **2000 deg F (1093 deg C)**.
- F. Minimum Pressure Rating: **10-inch wg (2500 Pa)**, positive or negative.

## 2.14 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Ductmate Industries, Inc.
  - 2. Duro Dyne Inc.
  - 3. Ventfabrics, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Metal-Edged Connectors: Factory fabricated with a fabric strip **3-1/2 inches (89 mm)** wide attached to 2 strips of **2-3/4-inch- (70-mm-)** wide, **0.028-inch- (0.7-mm-)** thick, galvanized sheet steel or **0.032-inch- (0.8-mm-)** thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
  - 1. Minimum Weight: **26 oz./sq. yd. (880 g/sq. m)**.
  - 2. Tensile Strength: **480 lbf/inch (84 N/mm)** in the warp and **360 lbf/inch (63 N/mm)** in the filling.
  - 3. Service Temperature: **Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C)**.
- F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
  - 1. Minimum Weight: **24 oz./sq. yd. (810 g/sq. m)**.
  - 2. Tensile Strength: **530 lbf/inch (93 N/mm)** in the warp and **440 lbf/inch (77 N/mm)** in the filling.
  - 3. Service Temperature: **Minus 50 to plus 250 deg F (Minus 45 to plus 121 deg C)**.
- G. High-Temperature System, Flexible Connectors: Glass fabric coated with silicone rubber.
  - 1. Minimum Weight: **16 oz./sq. yd. (542 g/sq. m)**.
  - 2. Tensile Strength: **285 lbf/inch (50 N/mm)** in the warp and **185 lbf/inch (32 N/mm)** in the filling.
  - 3. Service Temperature: **Minus 67 to plus 500 deg F (Minus 55 to plus 260 deg C)**.
- H. High-Corrosive-Environment System, Flexible Connectors: Glass fabric with chemical-resistant coating.

1. Minimum Weight: 14 oz./sq. yd. (474 g/sq. m).
  2. Tensile Strength: 450 lbf/inch (79 N/mm) in the warp and 340 lbf/inch (60 N/mm) in the filling.
  3. Service Temperature: Minus 67 to plus 500 deg F (Minus 55 to plus 260 deg C).
- I. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
  2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
  3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
  4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
  5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
  6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
  7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch (6-mm) movement at start and stop.

## 2.15 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
  1. Coordinate subparagraphs below with Division 23 Section "Metal Ducts." Install steel volume dampers in steel ducts.
  2. Install aluminum volume dampers in aluminum ducts.

3. Provide manual balancing volume dampers as required properly balance the air distribution system. If the location of balancing dampers are not defined on the drawings, the following minimum standards shall govern:
    - a. Low Pressure: All supply main air branches from trunk, each split, and all sub branches from main shall be provided with balancing dampers.
    - b. Low Pressure: All exhaust main air branches from trunk, each split, and all sub branches from main shall be provided with balancing dampers.
    - c. Medium Pressure: All branches and takeoffs downstream of terminal boxes (CV, VAV and FPB) shall be provided with balancing dampers.
    - d. Ducts connecting to common plenums.
    - e. Ducts serving single outlet.
    - f. At open return duct in hung ceiling.
    - g. As noted on plans.
  4. For internally lined ductwork: Provide 2 internal saddles to protect lining.
  5. Install levers to be accessible through the insulation
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install, combination fire & smoke fire and smoke dampers according to UL listing.
- H. Install duct security bars. Construct duct security bars from 0.164-inch (4.18-mm) steel sleeve, continuously welded at all joints and 1/2-inch- (13-mm-) diameter steel bars, 6 inches (150 mm) o.c. in each direction in center of sleeve. Weld each bar to steel sleeve and each crossing bar. Weld 2-1/2-by-2-1/2-by-1/4-inch (63-by-63-by-6-mm) steel angle to 4 sides and both ends of sleeve. Connect duct security bars to ducts with flexible connections. Provide 12-by-12-inch (300-by-300-mm) hinged access panel with cam lock in duct in each side of sleeve.
- I. Connect ducts to duct silencers rigidly.
- J. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
  1. On both sides of duct coils.
  2. Downstream from manual volume dampers, control dampers, turning vanes, and equipment.
  3. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
  4. At each change in direction and at maximum 50-foot (15-m) spacing.
  5. Upstream of turning vanes.
  6. Elsewhere as indicated.
- K. Install access doors with swing against duct static pressure.
- L. Access Door Sizes:
  1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
  2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
  3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
  4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
  5. Body Access: 25 by 14 inches (635 by 355 mm).
  6. Body plus Ladder Access: 25 by 17 inches (635 by 430 mm).

- M. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- N. Install flexible connectors to connect ducts to equipment.
- O. For fans developing static pressures of 5-inch wg (1250 Pa) and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- P. Connect terminal units to supply ducts directly. Do not use flexible ducts. Provide flexible connections for all fan powered terminal boxes.
- Q. Connect diffusers to low-pressure ducts directly.
- R. Install duct test holes where required for testing and balancing purposes.
- S. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch (6-mm) movement during start and stop of fans.

### 3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  1. Operate dampers to verify full range of movement.
  2. Inspect locations of access doors and verify that purpose of access door can be performed.
  3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
  4. Inspect turning vanes for proper and secure installation.
  5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION



**SECTION 23 34 16**  
**Centrifugal HVAC Fans**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Airfoil centrifugal fans.
  - 2. Backward-inclined centrifugal fans.
  - 3. Laboratory exhaust fans

**1.3 PERFORMANCE REQUIREMENTS**

- A. Project Altitude: Base fan performance ratings on sea level.
- B. Operating Limits: Classify according to AMCA 99.

**1.4 SUBMITTALS**

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
  - 1. Certified fan performance curves with system operating conditions indicated.
  - 2. Submit the family of rpm curves indicating operating point relative to fan class.
  - 3. Drive construction and rating.
  - 4. Catalog cuts and dimension drawings.
  - 5. Submit all selected sheave (fan and motor) calculations.
  - 6. Correction chart for fans equipped with variable inlet vanes indicating performance at various percentage of opening.
  - 7. VFD application: Submit fan selection with system curve indication, operating point, family of all rpm curves in fan class and the "DO NOT SELECT TO THE LEFT OF THIS CURVE". The minimum rpm shall be indicated.
  - 8. Certified fan sound-power ratings.
  - 9. Motor ratings and electrical characteristics, plus motor and electrical accessories.
  - 10. Material thickness and finishes, including color charts.
  - 11. Dampers, including housings, linkages, and operators.
  - 12. Roof curbs
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 1. Wiring Diagrams: Power, signal, and control wiring.
  - 2. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.

3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.
- C. Coordination Drawings: Show fan room layout and relationships between components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate and certify field measurements.
  - D. Field quality-control test reports.
  - E. Operation and Maintenance Data: For centrifugal fans to include in emergency, operation, and maintenance manuals.
- 1.5 QUALITY ASSURANCE
- A. 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. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.
    1. Test and rate all fans in accordance with the standards of AMCA. All fans shall bear the AMCA rating and seal.
  - C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA 1.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations, with protective crating and covering.
  - B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.
  - C. Lift and support units with manufacturer's designated lifting or supporting points.
- 1.7 COORDINATION
- A. Coordinate size and location of structural-steel support members.
  - B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
  - C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."
- 1.8 EXTRA MATERIALS
- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
    1. Belts: One set(s) for each belt-driven unit.
    2. Sheaves : One set(s) for each unit

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. Make appropriate allowances for the effects on fan performance of all installation conditions including plenum enclosures and inlet and discharge arrangements so that actual installed fan performance equals that specified.
- B. Fans shall be non-overloading and operate stably without surging at design conditions.
- C. Fan characteristic curves provided by manufacturer must be such that that the fan operating point:
  - 1. Is to the right of peak efficiency.
  - 2. Is on the steep part of the fan curve such that an increase in static pressure over the specified duty results in not more than the same percent decrease in volume (CFM) and does not affect the stability of fan operation.
  - 3. Is no greater than 60 to 70 percent of the peak static pressure.
  - 4. Has the ability to provide an allowable increase in fan speed of 15 percent above the design point without surging or increasing the class of fan.
- D. Provide non-overloading design, except as noted with minimum capacities as noted and with certified ratings by AMCA.
- E. Wheel shall be factory balanced statically and dynamically. Brake horsepower ratings shall be 5 percent maximum above those noted and published for a minimum of two (2) years.
- F. Motor pulley shall be variable pitch diameter, for fans up to 25 hp and 1000 rpm, except fans with variable inlet vanes and VFD's use fixed pitch, and fixed pitch diameter, over 25 hp or 1000 rpm. Supply and install one fixed pitch pulley change, as required, per fan to balance systems. Companion sheaves shall maintain belts parallel. Belt guards shall be in compliance with OSHA regulations and with tachometer opening for fan speed measurements. Manufacturer shall provide replacement fixed pitched sheaves where needed to balance system.
- G. Provide removable flanged screens at inlets or outlets where no connecting ductwork is indicated, including inlets to fans in field erected casings.
- H. Bearings shall be ball, roller or taper. Provide pressure type lubricating fittings with pressure relief fittings extended to accessible locations. Lubricating fittings shall be similar to Alemite. Pressure relief fittings shall be similar to Keystone. For fans 27 inch and larger, provide housings horizontally split, roller bearings.
- I. Split construction: Provide split construction for fans too large for available doorways or passageways. Split in half along center of shaft with angles, etc., to allow removal of section without disturbing inlet and discharge connection; arranged for bolting. Provide bolts with lockwashers and nuts. Construction shall be inspected by manufacturer after field assembly and certified that they have been properly assembled and ready for proper operation.
- J. The drive end of the fan shaft shall be countersunk for tachometer readings.
- K. For all fans located outdoors, except roof ventilators exposed to the weather, provide custom fitted weather guards completely enclosing the fan motor, drive and bearings. Provide weatherproof louvers in the enclosure to permit circulation of air but to exclude rain and snow. Arrange one side of the enclosure to be completely removable for

access to motors, drives, bearings and other equipment located within requiring maintenance. Construct the enclosure of 16 gauge aluminum, braced with aluminum angles. Paint the fan exterior with two coats of weatherproof aluminum paint.

## 2.2 AIRFOIL CENTRIFUGAL FANS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Aerovent; a Twin City Fan Company.
  - 2. Greenheck
  - 3. Loren Cook Company.
- B. Description: Factory-fabricated, -assembled, -tested, and -finished, belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, and support structure.
  - 1. The fan shall be of welded construction utilizing corrosion resistant fasteners. The scroll wrapper and scroll side panels shall be minimum 12 gauge steel (minimum 8 gauge steel for Class III).
- C. Housings: Formed panels to make curved-scroll housings with shaped cutoff, with doors or panels to allow access to internal parts and components.
  - 1. The entire fan housing shall have continuously welded seams for leak proof operation and shall have a minimum 1-1/2 inch outlet discharge flange. A performance cut-off shall be furnished to prevent the recirculation of air in the fan housing. Bearing support shall be minimum 1/4 inch steel. Lifting lugs shall be provided for ease of installation. Unit shall bear an engraved aluminum nameplate and shall be shipped in ISTA certified transit tested packaging.
  - 2. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.
  - 3. Spun inlet cone with flange.
  - 4. Outlet flange.
- D. Airfoil Wheels: Single-width-single-inlet and double-width-double-inlet construction with curved inlet flange; heavy backplate; hollow die-formed, airfoil-shaped blades continuously welded at tip flange and backplate; and cast-iron or cast-steel hub riveted to backplate and fastened to shaft with set screws.
- E. Shafts: Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.
  - 1. Turned, ground, and polished hot-rolled steel with keyway. Ship with protective coating of lubricating oil.
  - 2. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.
- F. Grease-Lubricated Shaft Bearings for fans less than 1500 rpm: Self-aligning, pillow-block-type, tapered roller bearings with double-locking collars and two-piece, cast-iron housing.
  - 1. Ball-Bearing Rating Life: ABMA 9, L10 at 120,000 hours.
  - 2. Roller-Bearing Rating Life: ABMA 11, L10 at 120,000 hours.
- G. Grease-Lubricated Shaft Bearings for fans greater than 1500 rpm: Self-aligning, pillow-block-type, ball or roller bearings with adapter mount and two-piece, cast-iron housing.

1. Ball-Bearing Rating Life: ABMA 9, L10 at 120,000 hours.
  2. Roller-Bearing Rating Life: ABMA 11, L10 at 120,000 hours.
- H. Belt Drives: Factory mounted, with final alignment and belt adjustment made after installation.
1. Service Factor Based on Fan Motor Size: 1.5.
  2. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
  3. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
  4. Belt Guards: Fabricate to comply with OSHA and SMACNA requirements of diamond-mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation. Include provisions for adjustment of belt tension, lubrication, and use of tachometer with guard in place.
  5. Motor Mount: Adjustable for belt tensioning.
- I. Accessories:
1. Scroll Access Doors: Shaped to conform to scroll, with quick-opening latches and gaskets.
  2. Cleanout Door: Quick-opening, latch-type gasketed door allowing access to fan scroll, of same material as housing.
  3. Scroll Drain Connection: NPS 1 (DN 25) steel pipe coupling welded to low point of fan scroll.
  4. Companion Flanges: Rolled flanges for duct connections of same material as housing.
  5. Discharge Dampers: Assembly with opposed blades constructed of two plates formed around and to shaft, channel frame, and sealed ball bearings; with blades linked outside of airstream to single control lever of same material as housing.
  6. Inlet Screens: Grid screen of same material as housing.
  7. Kitchen exhaust fans are to be arrangement #10, UL762 rated, provide grease drain, grease collector, high temperature resistant paint
  8. Shaft Cooler: Metal disk between bearings and fan wheel, designed to dissipate heat from shaft. (kitchen exhaust only)
  9. Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.
  10. Weather Cover: Enameled-steel sheet with ventilation slots, bolted to housing.
- J. Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
1. Enclosure Type: Totally enclosed, fan cooled.

## 2.3 BACKWARD-INCLINED CENTRIFUGAL FANS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Aerovent; a Twin City Fan Company.
  2. Loren Cook Company.
  3. Greenheck
- B. Description: Factory-fabricated, -assembled, -tested, and -finished, belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, and support structure.

- C. Housings: Formed panels to make curved-scroll housings with shaped cutoff; with doors or panels to allow access to internal parts and components.
  - 1. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.
  - 2. Spun inlet cone with flange.
  - 3. Outlet flange.
- D. Backward-Inclined Wheels: Single-width-single-inlet and double-width-double-inlet construction with curved inlet flange, backplate, backward-inclined blades welded or riveted to flange and backplate; cast-iron or cast-steel hub riveted to backplate and fastened to shaft with set screws.
- E. Shafts: Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.
  - 1. Turned, ground, and polished hot-rolled steel with keyway. Ship with a protective coating of lubricating oil.
  - 2. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.
- F. Grease-Lubricated Shaft Bearings for fans less than 1500 rpm: Self-aligning, pillow-block-type, tapered roller bearings with double-locking collars and two-piece, cast-iron housing.
  - 1. Ball-Bearing Rating Life: ABMA 9, L10 at 120,000 hours.
  - 2. Roller-Bearing Rating Life: ABMA 11, L10 at 120,000 hours.
- G. Grease-Lubricated Shaft Bearings for fans greater than 1500 rpm: Self-aligning, pillow-block-type, ball or roller bearings with adapter mount and two-piece, cast-iron housing.
  - 1. Ball-Bearing Rating Life: ABMA 9, L10 at 120,000 hours.
  - 2. Roller-Bearing Rating Life: ABMA 11, L10 at 120,000 hours.
- H. Belt Drives: Factory mounted, with final alignment and belt adjustment made after installation.
  - 1. Service Factor Based on Fan Motor Size: 1.5.
  - 2. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
  - 3. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
  - 4. Belt Guards: Fabricate to comply with OSHA and SMACNA requirements of diamond-mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation. Include provisions for adjustment of belt tension, lubrication, and use of tachometer with guard in place.
  - 5. Motor Mount: Adjustable for belt tensioning.
- I. Accessories:
  - 1. Scroll Access Doors: Shaped to conform to scroll, with quick-opening latches and gaskets.
  - 2. Cleanout Door: Quick-opening, latch-type gasketed door allowing access to fan scroll, of same material as housing.
  - 3. Scroll Drain Connection: NPS 1 (DN 25) steel pipe coupling welded to low point of fan scroll.

4. Companion Flanges: Rolled flanges for duct connections of same material as housing.
  5. Discharge Dampers: Assembly with opposed blades constructed of two plates formed around and to shaft, channel frame, and sealed ball bearings; with blades linked outside of airstream to single control lever of same material as housing.
  6. Inlet Screens: Grid screen of same material as housing.
  7. Shaft Cooler: Metal disk between bearings and fan wheel, designed to dissipate heat from shaft. (kitchen exhaust only)
  8. Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.
  9. Weather Cover: Enameled-steel sheet with ventilation slots, bolted to housing
  10. Kitchen exhaust fans are to be arrangement #10, UL762 rated, provide grease drain, grease collector, high temperature resistant paint.
- J. Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
1. Enclosure Type: Totally enclosed, fan cooled.

## 2.4 SOURCE QUALITY CONTROL

- A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
- B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install centrifugal fans level and plumb.
- B. Support floor-mounting units using spring isolators having a static deflection of 1 inch (25 mm). Vibration- and seismic-control devices are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
  1. Secure vibration and seismic controls to concrete bases using anchor bolts cast in concrete base.
- C. Install floor-mounting units on concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."
- D. Install floor-mounting units on concrete bases designed to withstand, without damage to equipment, the seismic force required by authorities having jurisdiction. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."
- E. Support suspended units from structure using threaded steel rods and spring hangers having a static deflection of 1 inch (25 mm). Vibration-control devices are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- F. Install units with clearances for service and maintenance.

- G. Label fans according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

### 3.2 CONNECTIONS

- A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."
- B. Install ducts adjacent to fans to allow service and maintenance.
- C. Install line-sized piping from scroll drain connection, with trap with seal equal to 1.5 times specified static pressure, to nearest floor drain.
- D. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- E. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

### 3.3 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
  1. Verify that shipping, blocking, and bracing are removed.
  2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
  3. Verify that cleaning and adjusting are complete.
  4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
  5. Adjust belt tension.
  6. Adjust damper linkages for proper damper operation.
  7. Verify lubrication for bearings and other moving parts.
  8. Balance all fan wheels and all other moving components statically and dynamically. Where a coating is specified and it affects the balance of the fan wheel, perform the balancing after the coating has been applied.
  9. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
  10. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
  11. Disable automatic temperature-control operators, energize motor and confirm proper motor rotation and unit operation, adjust fan to indicated rpm, and measure and record motor voltage and amperage.
  12. For units with variable frequency drives lock out critical frequencies before initial start.
  13. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  14. Replace fan and motor pulleys as required to achieve design airflow.
  15. Shut unit down and reconnect automatic temperature-control operators.
  16. Remove and replace malfunctioning units and retest as specified above.



- B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

### 3.4 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Lubricate bearings
- D. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
- E. Replace fan and motor pulleys as required to achieve design airflow.

### 3.5 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain centrifugal fans. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

## SECTION 23 37 13

### Diffusers, Registers, and Grilles

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 SUMMARY

###### A. Section Includes:

1. Rectangular and square ceiling diffusers.
2. Linear bar diffusers.
3. Adjustable bar registers and grilles.
4. Fixed face registers and grilles.
5. Linear bar grilles.
6. Operating Room Diffusors
7. Operating Room Ceiling Grid

###### B. Related Sections:

1. Division 08 Section "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
2. Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

##### 1.03 SUBMITTALS

###### A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

###### B. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.

###### C. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.

###### D. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

5. Duct access panels.

E. Source quality-control reports.

## PART 2 - PRODUCTS

### 2.01 DIFFUSERS, REGISTERS AND GRILLES

A. Provide diffusers, registers and grilles for supply, return and exhaust outlets, of size, type, construction and design shown on Drawings.

B. Acceptable manufacturers:

1. Titus
2. Price Industries
3. Krueger
4. Metalaire
5. Tuttle & Bailey.

C. Equipment shall be tested and rated per ASHRAE 91-70.

D. Equipment shall handle air quantities at operating velocities:

1. With maximum diffusion within space supplied or exhausted.
2. Without objectionable air movement as determined by Architect.
3. With sound pressure level not to exceed NC 25.

E. Supply, return and exhaust outlets shall have opposed blade volume dampers operable from front (unless otherwise noted).

F. Supply registers shall have two sets of directional control blades.

G. Diffusers within same room or area shall be of same type and style to provide Architectural uniformity.

H. Diffusers, registers and grilles shall be furnished with gaskets and installed with faces set level and plumb, tightly against mounting surface.

I. Diffusers, registers and grilles shall be aluminum construction and painted with white enamel. Finish shall receive final approval from the Architect prior to ordering.

J. Provide all necessary equipment for complete installation, including: lined plenum boxes, frame types, etc. as called for on the drawings.

K. Coordinate diffusers, registers and grilles with ceiling and wall construction. Refer to Architectural Drawings for exact lengths and for framing and mitering arrangements that may differ from those shown on HVAC Drawings.

### 2.02 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.
- D. Noise level at noted capacities shall not exceed criteria specified in Section NOISE CONTROL. Diffusers shall be suitable for operation at 5 percent excess and 25 percent less than noted capacity. Provide blanking for proper coverage and blow without producing objectionable noise or air motion at occupied level. Finish shall match color sample as approved:
- E. Linear diffusers: Frame types shall mate with ceilings. Provide means to neatly butt and align units to give continuous appearance without butting flanges. No screw holes or welded corners visible on diffusers or frames will be permitted. Air volume shall be adjustable through air supply face without requiring removal of face panel. Provide blanked sections for inactive lengths. Provide plaster frames and opposed blade volume dampers with remote cable operators where noted. Refer to Architectural Drawings for mounting details and overall lengths. Finish shall match color sample as approved:
- F. Install all fire rated diffusers in compliance with NFPA and UL listed installation instructions.

### 3.03 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

### 3.04 OPERATING ROOM CEILING INSTALLATION

- A. Install all components in accordance with the manufactures' instructions in accordance to ASTM C 636.

- B. Main grid members are to be suspended on pre-stressed hanger wire at 4' (1200 mm) centers. Minimum gauge for the hanger wire shall be 12 gauge.
- C. Maximum allowable deflection shall not exceed L/360.
- D. Install ceilings to heights indicated on the plans and specifications to a tolerance of 1/8" in 12'-0" (3.2mm in 3660 mm).

END OF SECTION

## SECTION 23 72 00

### Air-To-Air Energy Recovery Equipment

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. Section Includes:
  - 1. Packaged energy recovery units.

##### 1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design vibration isolation and seismic-restraint details, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Seismic Performance: Air-to-air energy recovery equipment shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
  - 1. 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."

##### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, furnished specialties, and accessories.
- B. LEED Submittals:
  - 1. Product Data for Credit EQ 3.1, "Construction IAQ Management Plan": Replacement filtration media for occupancy.
- C. Shop Drawings: For air-to-air energy recovery equipment. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Wiring Diagrams: For power, signal, and control wiring.
- D. Delegated-Design Submittal: For air-to-air energy recovery equipment indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 1. Detail fabrication and assembly of air-to-air energy recovery equipment.
  - 2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
  - 3. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.

- E. Coordination Drawings: Plans, elevations, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
  - 1. Suspended ceiling components.
  - 2. Structural members to which equipment or suspension systems will be attached.
- F. Seismic Qualification Certificates: For air-to-air energy recovery equipment, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- G. Field quality-control reports.
- H. Operation and Maintenance Data: For air-to-air energy recovery equipment to include in maintenance manuals.

#### 1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. AHRI Compliance: Capacity ratings for air-to-air energy recovery equipment shall comply with AHRI 1060, "Rating Air-to-Air Energy Recovery Equipment."
- C. ASHRAE Compliance: Capacity ratings for air-to-air energy recovery equipment shall comply with ASHRAE 84, "Method of Testing Air-to-Air Heat Exchangers."
- D. NRCA Compliance: Roof curbs for roof-mounted equipment shall be constructed according to recommendations of NRCA.
- E. UL Compliance: Packaged heat recovery ventilators shall comply with requirements in UL 1812, "Ducted Heat Recovery Ventilators"; or UL 1815, "Nonducted Heat Recovery Ventilators."

#### 1.6 COORDINATION

- A. Coordinate layout and installation of air-to-air energy recovery equipment and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided.
- C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

#### 1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of air-to-air energy recovery equipment that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period for Packaged Energy Recovery Units: Two years.

## 1.8 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Filters: One set(s) of each type of filter specified.
  - 2. Fan Belts: One set(s) of belts for each belt-driven fan in energy recovery units.
  - 3. Wheel Belts: One set(s) of belts for each heat wheel.

## PART 2 - PRODUCTS

### 2.1 PACKAGED ENERGY RECOVERY UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Des Champs Technologies.
  - 2. Greenheck Fan Corporation.
  - 3. Loren Cook Company.
  - 4. Mitsubishi Electric & Electronics USA, Inc.; HVAC Advanced Products Division.
  - 5. RenewAire LLC.
  - 6. SEMCO Incorporated.
  - 7. Trane; American Standard Inc.
  - 8. Venmar CES Inc.
- B. Housing: Manufacturer's standard construction with corrosion-protection coating and exterior finish, gasketed and calked weathertight, hinged access doors with neoprene gaskets for inspection and access to internal parts, minimum **1-inch- (25-mm-)** thick thermal insulation, knockouts for electrical and piping connections, exterior drain connection, and lifting lugs.
  - 1. Inlet: Weatherproof louver, with gravity backdraft damper for exhaust and spring-return, two-position, motor-operated damper with blade seals for supply.
- C. Heat Recovery Device: Heat wheel
- D. Supply and Exhaust Fans: Backward-inclined, plenum centrifugal fan with spring isolators and flexible duct connections.
  - 1. Motor and Drive: Direct driven
  - 2. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
  - 3. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
  - 4. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.
  - 5. Spring isolators on each fan having **1-inch (25-mm)** static deflection.
- E. Extended-Surface, Disposable Panel Filters:
  - 1. Comply with NFPA 90A.
  - 2. Provide minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
  - 3. Provide filter holding frames arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lift out from access plenum.
  - 4. Factory-fabricated, dry, extended-surface type.
  - 5. Thickness: **2 inches (50 mm)**
  - 6. Merv (ASHRAE 52.2): 8
  - 7. Media: Fibrous material formed into deep-V-shaped pleats with antimicrobial agent and held by self-supporting wire grid.
  - 8. Media-Grid Frame: Nonflammable cardboard



9. Mounting Frames: Welded, galvanized steel with gaskets and fasteners, suitable for bolting together into built-up filter banks.
- F. Piping and Wiring: Fabricate units with space within housing for piping and electrical conduits. Wire motors and controls so only external connections are required during installation.
1. Indoor Enclosure: NEMA 250, Type 12 enclosure contains relays, starters, and terminal strip.
  2. Outdoor Enclosure: NEMA 250, Type 3R enclosure contains relays, starters, and terminal strip.
  3. Include nonfused disconnect switches.
  4. Variable-speed controller to vary fan capacity from 100 to approximately 50 percent.
- G. Accessories:
1. Low-Leakage, Isolation Dampers: Double-skin, airfoil-blade, extruded-aluminum dampers with compressible jamb seals and extruded-vinyl blade edge seals, in opposed blade arrangement with cadmium-plated steel operating rods rotating in sintered bronze or nylon bearings mounted in a single extruded-aluminum frame, with operating rods connected with a common linkage, and electric damper operator factory wired. Leakage rate shall not exceed 5 cfm/sq. ft. (0.22 L/s per sq. m) at 1-inch wg (250 Pa) and 9 cfm/sq. ft. (0.4 L/s per sq. m) at 4-inch wg (1.0 MPa).
  2. Duct flanges.
  3. Hinged access doors with quarter-turn latches.
  4. Drain pans for condensate removal.

## 2.2 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine casing insulation materials and filter media before air-to-air energy recovery equipment installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.
- C. Examine roughing-in for electrical services to verify actual locations of connections before installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

## 2.3 INSTALLATION

- A. Install floor-mounted units on 4-inch- (100-mm-) high concrete base designed to withstand, without damage to equipment, seismic force required by code.
- B. Install units with clearances for service and maintenance.
- C. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.
- D. Pipe drains from units and drain pans to nearest floor drain; use ASTM B 88, Type L drawn-temper copper water tubing with soldered joints, same size as condensate drain connection.

## 2.4 CONNECTIONS

- A. Comply with requirements for piping specified in Division 23 Section "Hydronic Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Comply with requirements for ductwork specified in Division 23 Section "Metal Ducts."
- C. Install piping adjacent to machine to allow service and maintenance.

## 2.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
  - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - 2. Adjust seals and purge.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
  - 4. Set initial temperature and humidity set points.
  - 5. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- D. Air-to-air energy recovery equipment will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

## 2.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-to-air energy recovery units.

END OF SECTION

**SECTION 23 73 14**  
**Custom Packaged Central Station Air Handling Units**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

- A. This section of the work includes the design, fabrication, testing, cleaning and packaging, shipment and final assembly of custom built-up air handling units by the unit manufacturer in complete accordance with the following specification.
- B. The details outlined and component manufacturers named in this specification may not be deviated from in the air handling unit manufacturer's preparation of the bid, even where techniques are required which are not considered standard by the manufacturer. The construction as described in this specification is considered essential, and any deviation from this specification must be specifically identified and bid as a Voluntary Alternate (add or deduct), but only after complying with the specification defined as the Base Bid.

**1.2 SUBMITTALS:**

- A. **WITH THE QUOTATION:** Provide the following detailed information on the equipment proposed Unit manufacturer shall itemize all deviations from the specified requirements. If not so indicated, unit manufacturer will be required to furnish at no cost to the owner:
  - 1. Information requested in the RFQ, including equipment data sheets, schedules and sketches.
  - 2. Equipment drawings showing dimensions, weights (shipping & operating), configuration, major component locations, access door locations, duct connection sizes and locations, and shipping split locations.
  - 3. Fan manufacturer and performance curves with the operating points clearly indicated. Motor sizes and types.
  - 4. Coil selections with sizes, rows, fin spacing, face velocities, temperatures, flow rates, pressure drops, & connection sizes.
  - 5. Proposed filters indicating size, efficiency, and pressure drop.
  - 6. Materials of construction for housing and major components.
  - 7. Airborne and transmitted sound power levels by octave band.
- B. **AFTER PURCHASE:** Make submittals in accordance with requirements of conditions of purchase. Submittals shall show Buyer's purchase order number, equipment number and project number. Information shall include, as applicable, but not be limited to the following:
  - 1. Information submitted with quotation, revised and expanded as required.
  - 2. If applicable) Electrical data, wiring diagrams, and accessory panel layouts. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
  - 3. If applicable) Factory testing procedures for review and acceptance.
- C. **AFTER RECEIPT OF APPROVED DRAWINGS:** Submit manuals with detailed description of installation, operation, and maintenance, including the following:
  - 1. All approved "Certified for Construction" drawings.

2. Written recommendations for field storage, both indoors and outdoors.
3. Installation requirements including assembly instructions, lifting requirements and adjustments.
4. Manufacturer's literature describing each piece of equipment furnished including operation instructions including step by step preparation of starting, shutdown, and draining and maintenance instructions including lubrication.

### 1.3 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data
- B. Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

### 1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience, who issues complete catalog data on total product.

### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 01 and Section 230000.
- B. Accept products on site in factory-fabricated protective containers, with factory-installed shipping skids. Inspect for damage.
- C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.
- D. The entire unit shall be sealed with wrap and have water absorption desiccant packs in each section to eliminate moisture during shipping.

### 1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

### 1.7 EXTRA STOCK

- A. Provide one complete set of extra disposable filters per air handling unit.

## PART 2 - PRODUCTS

### 2.1 CUSTOM AIR HANDLING UNITS MANUFACTURERS

- A. Manufacturers: Units shall be as manufactured by Trane Custom, York, and Ventrol.

### 2.2 CUSTOM AIR HANDLING UNIT

- A. Custom built-up units shall be of the configuration, capacity and style as indicated on the drawings and Equipment Schedule and as specified herein. Through properly designed access; ease of maintenance, removability of components, and unit serviceability shall be assured.

B. General:

1. The unit manufacturer shall be responsible for provisions of fans, dampers and all other unit and plenum components as specified in this section or other sections of this division and performance characteristics as shown in schedules or on drawings. The unit manufacturer shall provide all field labor for assembly of enclosure and components.
2. Unit shall be factory-fabricated for shipping and field assembly by experienced manufacturer of large custom air handling units that maintains engineering and production staff.
  - a. Provide proof of credentials of manufacturer's staff as required by Owner and Architect.
3. Shop drawings shall be subject to approval of the Owner and Architect.
4. Certify conformance with performance requirements specified and shown on Drawings.
5. Provide necessary appurtenances to perform as specified, whether or not expressly required by Contract Documents mentioned herein in conformance with good trade practice, as determined by Architect.
6. Seal any casing penetrations made in field for piping, conduit, tubing and equipment installed under other sections. Manufacturer shall supply contractor with details for sealing casing. Manufacturer's field service representative shall inspect and approve all casing penetrations

C. Testing:

1. Test to ensure structural integrity, design suitability under simulated operating conditions, systems operation and minimum vibration levels as specified. Certify that unit complies with design intent and Contract Documents.
2. Manufacturer shall be responsible for correcting any operating deficiencies found during the unit startup after installation.
3. Prior to shipping the following tests shall be performed:
  - a. Pressure test water coils if coil manufacturer has not already performed pressure test, and piping.
  - b. Energize electrical devices to ensure operational integrity prior to shipment. Replace non-functioning items.
  - c. Submit housing panel acoustical, structural and physical properties performance test data before shipment from independently certified test laboratory.
  - d. Performance Test:
    - 1) Perform a unit performance test in the factory. The performance test shall be done to determine unit flow rate, total static pressure across the fan, external static pressure available to overcome system losses, fan speed and input power to the fans. Filter losses shall be simulated to provide average filter loss [1/2(clean & dirty)]. Test results shall confirm the unit is able to produce the required CFM at the listed external static pressure drop on the drawing schedules. Fan brake horsepower shall not be greater than design power by more than 5 percent
    - 2) Unit Air Leakage Rate: Perform unit leak pressure test to meet air leakage rates not to exceed the following values at 1½ times the design static pressure (not to exceed 8 in. w.g.) Manufacturer shall be responsible for any corrections required to meet test criteria. Leak

test shall be performed before any ductwork is connected. Factory to provide blank off of openings

a) 1/2 of 1% of the Design Airflow

4. Provide the following field tests after unit assembly:
  - a. Unit operation and vibration analysis. Operate fans at design RPM, set fan drive and conduct complete vibration spectrum as specified. Fan, motor, drive and base assembly, vibration shall be brought to within specified levels. Check motor and drive vibration with fan as a completed assembly. Vibration levels shall be measured in velocity (in/sec peak) in the horizontal, axial and vertical direction on the housing of both fan bearings while tuned to the fan running speed. A second reading based on the overall shall be made as a check on other possible vibration sources other than balance. The following is the acceptance criteria in velocity (in/sec peak):

ISOLATOR SUPPORTS

Direction	Radial	Axial
Filtered	0.16	0.32
Overall	0.40	0.40

- D. Unit shall comprise of, but not limited to, sections shown on drawings and the following list:
  1. Double wall aluminum outer cabinet. Construction shall employ 'no through metal' design.
  2. Outside air intake section with minimum and economizer outside air dampers and return air damper.
  3. Pre-Filter (MERV 8 and 11)
  4. Blank filter frame section for future charcoal filters.
  5. Discharge HEPA Filters (OR units) ,Discharge MERV 14 for PACU and bed floor units.
  6. Air Blender
  7. Steam preheat coil
  8. Chilled water cooling coil
  9. Humidifier
  10. Supply air fan section.
  11. UV Lights at Cooling Coil
  12. Discharge Air Plenum
  13. Outdoor air and supply air flow stations (All units). Outdoor air flow station transducer shall be by unit manufacturer. ATC shall provide supply fan transducers.
  14. Smoke Isolation Supply Control dampers
  15. Return air Control dampers
- E. Provide safing between internal components and unit casing to prevent air bypass. Safing material shall match unit interior. All seams or voids between safing, components and unit casing shall be caulked and sealed airtight.
- F. Unit shall employ aluminum material wherever possible (panels, bases, supports, safing, etc).

2.3 AIR HANDLING UNIT BASE:

- A. The unit shall be constructed on 8 inch deep aluminum structural member. Roll formed materials are not acceptable. The base shall be designed to distribute loads properly

to a suitable mounting surface and be braced to support internal components without sagging, pulsating or oil canning. The base sections for the field fabricated units shall be provided as complete prefabricated sections for field joining.

- B. The entire unit base shall be fully welded and guaranteed waterproof; cooling coil condensate shall have a minimum 3" deep sump between structural members to serve as a drain pan to prevent building water damage from the unit. Sump to be 14 GA. stainless steel double-sloped towards units drains to positively remove condensate from the unit.
- C. The base floor shall be minimum 3/16" thick aluminum tread plate bonded to the base floor so that there is no thru metal. All seams on floor plates shall be continuously welded. The base floor shall be designed for a minimum live load of 100 pounds per square foot throughout the unit. The base floor is to be supported with adequate stiffening members to prevent oil canning. Unit base shall be provided with aluminum longitudinal base channels that provide adequate support to limit floor deflection to 1/200th of the span. The floor surface shall not be the source of strength for component and service personnel weight. Floors shall have a 2" turned up lip to form a waterproof surface.
- D. The perimeter support members shall be a minimum of 8" welded structural member properly sized to support all major components and the housing during rigging, handling and operation of the unit.
- E. The underneath side of the base pan and base perimeter shall be insulated with minimum 3" thick 1.5-pcf high density polyisocyanurate injectable foam insulation covered with a plastic sheet to form a vapor barrier. Vapor barrier material is to be continuous with no seams.
- F. Each section of the unit base shall contain a minimum 1" NPT drain to facilitate system washdown, maintenance and condensate removal. Areas in the base where potential standing water cannot be removed through drains or weep holes are not acceptable. Clean out drains shall be provided with removable caps of non-corrosive material.
- G. All equipment within air handling unit shall be provided with a minimum 2" high base to raise equipment off unit floor for housekeeping. Equipment mounted directly on unit floor is unacceptable.
- H. All unit base service openings shall be framed with a minimum 2" high water dam continuously welded to the floor.
- I. Fastening to floor plate or joining of unit sections to be accomplished by bolting through gasketed joints above the floor line. Fasteners which penetrate base floor plate are not acceptable.

#### 2.4 AIR HANDLING UNIT CASING:

- A. Air handling unit casing shall be built up from the unit base with panels. The unit manufacturer shall be the manufacturer of the panel system. Panels shall be load bearing and capable of forming the enclosure without additional structural members. Panels shall be joined together with independent joining member and fastened with stainless steel fasteners.
- B. All panels shall be double wall all aluminum construction with minimum .050" aluminum exterior and .050" solid aluminum interior skin. Interior finish to be smooth mill finish, exterior to be a low reflective textured mill finished. Fan sections shall have acoustical

absorptive panels. Acoustical absorptive panels shall not be used within 24" downstream of cooling coil. Each panel shall contain an integral frame or be properly supported by a structural framing system. Panel shall have continuous tight seal at the interior and exterior skins completely encapsulating the insulation.

1. The minimum panel thickness shall be 3" thick with 3-pcf high density polyisocyanurate injectable foam insulation. Core material shall comply with NFPA 90A requirements. Housing insulation shall have a "U" value greater than 0.07 BTU/Hr/Sq. Ft./ Deg. F.
- C. Thickness of the panel skin, core density, rib structural frame spacing shall be regulated to eliminate panel pulsation and restrict the maximum deflection to L/250 of any span at 12 inches TSP positive or negative plus snow and wind loading. Casings shall be built to exceed AMCA Class "C" requirements.
  - D. Casing system shall be guaranteed to assure the owner that system capacity, performance, and cleanliness standards specified are not compromised. All panel joints shall be sealed with gasket insulation. The gasketing shall be sealed to provide a full thermal and air leak free connection.
  - E. All casing walls shall be of panel construction, including the fan discharge walls and mixing section walls
  - F. Panel system shall incorporate an integral thermal break system throughout the unit such that there is no through metal path between the interior and exterior surface of the unit casing at all locations. Criteria to evaluate requirement for thermal break system shall be based upon scheduled unit performance and ambient conditions anticipated around the units. The preferred method for a thermal break shall consist of a minimum ½" structural epoxy bridge.
  - G. Any equipment flashing, internal partitions or other attachments to the casing shall be made in such a way as to ensure a permanent leak-tight connection. Attachments that are bolted, screwed, or welded to or through the casing creating air bypass, air leakage or rust propagation areas are not acceptable.
  - H. All ductwork penetrations through unit enclosure shall be provided with framed openings of size indicated on drawing. Openings to be provided with flanged duct connections of same material as casing interior extending a minimum of 4" from surface of unit casing. All piping and conduit penetrations shall be provided with sleeves sealed watertight to unit casing; pipe penetrations through the unit casings shall be by the unit manufacturer and be properly sealed prior to leaving the factory. Penetrations created by cutting through panels, compromising panel integrity, will not be acceptable. Penetrations made in the field shall be made under the supervision of the factory air handling units representative.
  - I. Provide minimum 24" wide access doors for access to all internal components. Access doors shall be installed to open against the greatest pressure relative to air pressure on each side of access door
    1. Access doors shall be of the same construction as panels described above. Corners shall be seal welded for rigidity and air tightness. Mitered and caulked corners are unacceptable.
    2. The access doors shall be guaranteed tight closing by the means of two continuous separate gasket seals around the entire periphery of the door or panel set at a beveled 45° angle to assure a true perpendicular, non-shearing compression fit. Gasket material shall be UV-resistant, closed cell neoprene;



gaskets shall be attached by adhesive and not be mechanically held in place. Single gasket seals or 90° gasket configurations will not be accepted.

3. Each access door shall contain a thermopane tempered safety glass window (min. 10" square). Window assembly shall have a vacuum between panes to prevent condensation
4. Each access door shall have a built-in static pressure probe port with cap plug for ease of pressure readings across various internal components. Provide minimum 1" dia. test ports with screwed caps on casing upstream and downstream of all coils and filters for pressure and temperature measurement.
5. Each access door shall be mounted with stainless steel fully adjustable hinges, and shall have a least two (2) non-corrosive handles operable from either side. The door handles shall include self-locking nuts and stainless steel hardware to assure a long term proper door operation. Door handle striker plates shall be non-metallic high impact nylon with a notched "center position" to lock the handle in place. No moving parts shall contact the casing materials. Door tie backs shall be provided on all doors.
6. Removable access panels shall be provided as indicated on the drawings for service and maintenance. Access panels shall be of the same construction as panels described above. Removable access panels shall be designed and constructed such that removal and replacement may be accomplished without disturbing adjacent panels. Airtight integrity must be maintained.

## 2.5 AIR HANDLING UNIT ROOF CONSTRUCTION

- A. The roof section shall be 3" thick double wall
- B. The exterior skin of the roof shall be .05" thick aluminum, with .050" thick interior skin and internal channel supports
- C. 3" injectable foam insulation, with an R-value of 6.2 per inch, shall be used over the entire roof. Insulation shall meet all NFPA 90A requirements
- D. All panel seams shall be caulked with sealant.
- E. When a unit is split into sections, 2" x 1/4" perimeter companion channel with ridge cap shall be provided.

## 2.6 MOTORS

- A. REFER TO DIVISION 23 SECTION "COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT"

## 2.7 AIR HANDLING UNIT ELECTRICAL:

- A. Provide non-corroding vaportight cold weather LED light fixtures in each AHU compartment suitable for use in wet and damp locations.
  1. Lights shall have 120V cold weather ballasts with emergency backup power pack and shall comply with UL Standard #1570 and shall carry the UL label.
  2. Wiring shall be #12 copper type THHN in liquid tight conduct. Wire to cast watertight switch boxes with 60 minute timer switch, and trim plate on exterior of casing at each access door. Each timer switch shall energize lights in adjoining section of casing.
  3. Conduit and wiring to light fixtures and convenience outlets shall be brought back to a single NEMA 3R junction box at the exterior of the air handling unit for single

source power connection. Provide circuiting per NEC (1600 watts max per circuit).

4. Provide two (2) 1 ¼" liquid tight raceways along the entire top length of each unit section. Provide an internal junction box and conduit connection to allow for routing of temperature controls wiring and tubing through air handling unit.
- B. Provide duplex 120V, GFI, service outlet (outdoor use) in all accessible sections. Conduit and wiring to outlets shall be brought back to a single junction box (not same as lighting) for single source power connection.
- C. Extend motor leads to an external NEMA 1 service fused disconnect switch for each fan.
- D. The AHUs shall be wired 100% by manufacturer for connection by electrical contractor with separate main junction boxes for 120v and 460v power feeds for each VFD/fan motor. Electric work shall be in accordance with National Electrical Code and requirements of Section 26000.

## 2.8 PLUG/PLENUM FANS (SUPPLY)

- A. Fan shall be a single width, single inlet backward inclined centrifugal airfoil, direct driven plenum blowers as specified.
- B. The fans shall be of bolted and welded construction utilizing corrosion resistant fasteners. The inlet panel shall be constructed from minimum 10-gauge steel with a spun aluminum inlet cone. Bearings shall be supported on a welded assembly constructed of minimum ¼' x 2 ½" steel. The inlet panel and bearing support structure shall be attached to a frame constructed of 2"x2"x ¼: steel tubing with continuously welded joints
- C. Wheel shall be aluminum, non-overloading, centrifugal backward inclined, airfoil type. Blades on all sizes shall be continuously welded to the backplate and deep spun inlet shroud. All sizes shall be securely keyed to the fan shaft. Wheel shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be factory balanced in accordance with AMCA standard 204-96, Balance Quality and Vibration Levels for Fans after the fan and motor have been mounted on the factory provided inertia pads.
- D. Blower shaft shall be AISI C-1045 hot rolled and accurately turned, ground and polished. Shafting shall be sized for a critical speed of at least 125% of maximum RPM.
- E. Provide OSHA screened enclosures for plenum fans
- F. Plenum fans shall be as manufacturer by Twin Cities and include Piezometer air flow monitoring stations. Pneumatic lines from air flow stations shall extend through unit casing for use by ATC
- G. All fans shall be mounted on spring isolators. The base shall be of sufficient size and thickness for the fan and motor size as scheduled.
- H. Bearings are to be heavy duty, grease lubricated, anti-friction ball or roller self aligning, pillow block type and selected for minimum average bearing life (AFBMA L-50) in excess of 200,000 hours at the maximum class RPM. All bearings shall be equipped with re-greasable Zerk fittings. Grease fittings shall be at the fan and not extended to the exterior casing.

- I. The unit manufacturer shall provide flexible connection between fan and fan wall. Fan assembly shall be provided with thrust arrestors as required to prevent damage to the flex connection. Flex connection shall be flame retardant fabric suitable for intended use meeting the requirements of NFPA 90A.

## 2.9 FILTER SECTIONS:

- A. Provide all prefilters and final filters of number, size and capacity as required for air handling system indicated on drawings and as stated in these specifications
- B. Filters shall have nominal rating of 500 fpm. Each cell shall be 24" x 24", or 12" x 24". Initial pressure drop shall not exceed that indicated. Filter media efficiency will be tested in accordance with ASHRAE Test Standard 52-76. Filters will be listed by Underwriters Laboratory (UL) as Class 2.
- C. Media shall be approved and listed as Underwriters Laboratories Class 2 when tested according to UL Standard 900 and as described below:
  1. Filters (MERV 8 Prefilter):
    - a. Shall be UL Class 2, 2" thick MERV 8 pleated fabric filter for supply filters.
    - b. Filter shall have welded steel wire grid support
    - c. Filters shall not unload or collapse under high velocity or static pressure.
    - d. Efficiency shall be MERV 8 as measured by ASHRAE Test Standard 52-76.
    - e. Initial pressure drop shall be more than 0.28" at a velocity of 500 fpm. Filters shall be designed to operate at up to 500 fpm for the 2" thick filter.
    - f. Provide 2 sets of prefilters
    - g. Filters shall be Farr 30/30 or equivalent by AAF or Aerostar
  2. Filters (MERV 11 Prefilter):
    - a. Shall be UL Class 2, 12" thick MERV 11 pleated fabric filter for supply filters.
    - b. Filter media shall be of ultra-fine fiberglass formed into a thin paper-like mat with a water repellant binder. Construction shall be dual density, consisting of coarser fibers on the air entering side and finer fibers on the air leaving side, to enhance full depth particle collection. The rigid media pack shall consist of media pleats, structurally bonded one to the other, in order to maximize media area while minimizing pack depth. Corrugated media separators or wire media support grids shall not be required. The eight mini-pleats shall be arranged in a series of four Vs, with an overall filter depth of 12"
    - c. The media pack shall be contained within the frame of rigid polystyrene plastic or galvanized steel for high wet strength and moisture resistance. The pack shall be bonded inside the double wall frame on all four edges to prevent leakage and increased rigidity
    - d. Efficiency shall be MERV 11 as measured by ASHRAE Test Standard 52-76.
    - e. Provide 2 sets of prefilters
    - f. Filters shall be Farr Durafil ES mini-pleated V-Bank or equivalent by AAF or Aerostar
  3. Final HEPA filters (downstream of supply fan section) OR units only: 12" rigid separator style pleated filter.
    - a. HEPA filters shall be extended media separator type filters with a minimum efficiency of 99.97% on 0.30 micrometer particles.

- b. Filters shall be UL900 Class 2.
  - c. The separator style filter pack shall be constructed by pleating a continuous sheet of non-woven water resistant fiberglass media around hemmed-edge corrugated aluminum separators.
  - d. The filter pack shall be sealed into a galvanized frame with a fire retardant sealant
4. Final filters (Downstream of supply fan section) PACU and Bed floor units only; 12" rigid mini pleat type MERV 14 rigid disposable filter.
- a. Filter media shall be of ultra-fine fiberglass formed into a thin paper-like mat with a water repellent binder. Construction shall be dual density, consisting of coarser fibers on the air entering side and finer fibers on the air leaving side, to enhance full depth particle collection. The rigid media pack shall consist of media pleats, structurally bonded one to the other, in order to maximize media area while minimizing pack depth. Corrugated media separators or wire media support grids shall not be required. The eight mini-pleats shall be arranged in a series of four Vs, with an overall filter depth of 12"
  - b. The media pack shall be contained within the frame of rigid polystyrene plastic or galvanized steel for high wet strength and moisture resistance. The pack shall be bonded inside the double wall frame on all four edges to prevent leakage and increased rigidity
- D. Filters shall be upstream removable.
- E. Filter frames shall be aluminum or stainless steel construction with associated clips required to hold filter cells. Pre filter and final filter frames to be provided with closed cell neoprene gasketing.
- F. Filter holding frames shall be installed and individually sealed to prevent leakage around frames. Filter banks shall be reinforced with vertical stiffeners to assure rigidity. Unit manufacturer shall provide flashing between filter banks and unit casings to prevent air leakage or bypass around the frames. Installation techniques, sealing methods, and structural reinforcement eliminate unfiltered air bypass and assure system cleanliness based on filter efficiencies specified.
- G. For the HEPA filter frames, provide 11 gauge welded filter racks, using swing arm bolts to secure filters.
- H. Provide filter gauges for each filter as follows:
- 1. Dwyer Magnahelic Type 2002 AF dry air filter gauge, with scale of 0 to 2" across filter, with appropriate static pressure taps, vent valves, and tubing with flag suitably marked to indicate need to change filter for prefilters and final filters.

#### 2.10 AIR BLENDER UNITS

- A. Acceptable Manufacturers: Blender Products, Inc. -Series IV AIR BLENDER® static mixer
- B. Static mixing devices shall be installed where shown on plans to enhance the mixing of outside air with return air to a mixing effectiveness required to eliminate Freeze stat trips, minimize sensor error and enhance outdoor air distribution. Furthermore the air mixing device shall provide even airflow across filters, coils and control sensors.
- C. The pressure drop rating for static air mixers shall include the pressure loss due to the mixer design and the mixer-to- plenum area ratio.

- D. Detailed documentation of performance testing shall be made available upon request
- E. Static air mixers shall be geometrically scaled to ensure consistent performance across full range of sizes offered. Mixers that are not geometrically scaled are not acceptable. Mixers shall be of counter rotational design.
- F. Construction: Static air mixers shall be welded and mechanically fastened .080" or .125" thk. Aluminum. Static air mixers shall have Bare finish.
- G. Installation: Installation shall be in accordance with the manufacturer's written installation instructions and SMACNA plenum construction guidelines. If necessary, provide reinforcing in plenum where the Mixing Device Is Installed To Eliminate Excess Vibration or Deflection of Blank off Plenum.

#### 2.11 AIR CONTROL DAMPERS

- A. Dampers shall be low leakage, opposed blade design capable of withstanding 8" wg differential pressure at 2,000 fpm approach velocity. Leakage rate not to exceed 6 CFM per ft.<sup>2</sup> at 4" wg differential pressure and 2,000 fpm approach velocity.
- B. Damper frames shall be made of extruded aluminum. Damper blades shall be extruded aluminum airfoil shape to withstand high velocities and static pressures. Leakage not to exceed 8 cfm per square foot through a 36 inch by 36 inch damper at 4" w.g. pressure differential
  - 1. Frames: .080" extruded aluminum. Damper frame is 4 inches deep and is insulated with polystyrofoam. Frame is assembled using type 316 stainless steel screws.
  - 2. Blades: Airfoil shaped extruded aluminum, maximum 48 inches long. Blades shall be insulated with polyurethane foam and thermally broken.
  - 3. Bearings: Celcon inner bearing fixed to a 7/16 inch aluminum hexagon blade pin, rotating with a polycarbonate outer bearing inserted in the frame.
  - 4. Blade Seals: Extruded silicone secured in an integral slot within the aluminum extrusions
  - 5. Damper shall be selected on the basis of the pressure class. Linkage hardware is installed in the frame side. All aluminum linkage hardware parts are clear anodized. All non-aluminum linkage hardware parts are type 316 stainless steel.
  - 6. All dampers shall be provided with jack shafts
  - 7. Control actuators shall be provided by ATC contractor
- C. Acceptable dampers: TAMCO Series 9000 thermally insulated series.

#### 2.12 INJECTION TYPE HUMIDIFIER PANELS:

- A. Each panel shall consist of a steam supply header/separator, a condensate collection header and a bank of closely spaced steam dispersion tubes spanning the distance between the two headers. Each steam outlet in tubes shall contain a steam orifice sized for its required steam capacity. The humidifier shall provide absorption characteristics that preclude water accumulation on any in-duct surface within 36" downstream of the humidifier tube panel while maintaining conditions of 90% (maximum) relative humidity at a minimum temperature of 55°F in the duct air stream. Air pressure loss across humidifier panel shall not exceed 0.10" W.C. at a duct air velocity of 500 FPM. Humidifiers in air handling units shall have assemblies sized to

match the unit's cooling coil casing size. Humidifiers shall be Ultra-Sorb by Dri-Steem. Humidifiers shall be purchased locally.

- B. Each packaged humidifier panel assembly of tubes and headers shall be contained within a stainless steel metal casing to allow convenient duct mounting or to facilitate the stacking of and/or the end-to-end mounting of multiple panels in ducts or air handler casings.
- C. All tubes and headers shall be of 304 stainless steel and joints shall be heli-arc welded. Tubes shall be joined to headers with slip fit couplers.
- D. Insulated dispersion tubes. Dispersion tubes shall be insulated with a plenum-approved insulating material for in-duct installation and have an R-value not less than 0.5 at a thickness not more than 0.125" (3.2 mm), for minimal increase in dispersion tube diameter.
  - 1. Airstream heat gain shall not exceed the values as scheduled; the values shall be supported by the manufacturer's published data.
  - 2. Insulating material shall meet the following criteria at 0.125" (3.2 mm) thickness:
    - a. Fire/smoke index shall be 0/0 per any of the following test procedures: – UL 723 fire/smoke index (Test for Surface Burning Characteristics of Building Materials) – NFPA 255 (Standard Method of Test of Surface Burning Characteristics of Building Materials) – ASTM E84 (Surface Burning Characteristics for Materials Used in Plenums).
    - b. Stable up to 300 °F (148 °C) continuous – to prevent material degradation, hardening, or crumbling at high temperatures
    - c. Closed-cell construction does not absorb water or support microbial growth – to negate the need for vapor barriers and jackets
    - d. Non-toxic and pure as documented in manufacturer's data – to prevent off-gassing and to facilitate use in clean rooms, pharmaceutical applications, and food industries
    - e. Will not degrade when exposed to UVC light – to negate the need for UV wraps
    - f. Continuous, seam-welded, and held in place without bands or clamps – to minimize surfaces for the accumulation of particulate matter

## 2.13 MOTORIZED CONTROL SMOKE DAMPERS

- A. Dampers shall be UL555S rates as manufactured by Ruskin Inc. or approved equal.
- B. Leakage characteristics shall be based upon test procedures per AMCA Standard 500 that shows air leakage at 6 cfm per sq. ft at 4" wg differential pressure. Dampers shall be suitable for 9" w.c. static pressure and 6000 FPM free velocities.
- C. Frames and blades to be minimum 13 ga. Galvanized steel. Blades to be of single unit design.
- D. Provide overlapping blades and seals (not just overlap seals) to assure minimum air leakage. Provide extruded silicone seals fit into a ribbed groove insert in blades with a formed stainless steel, spring steel at the jamb.
- E. Rod bearings shall be designed so that there shall be no metal-to-metal or metal-to-bearing riding surfaces. Interconnecting linkage to have separate Celcon bearing to eliminate friction in linkage.
- F. Blade linkage hardware shall be of non-corrosive reinforced material or cadmium plated steel.

- G. All dampers shall be parallel blade type.

#### 2.14 STEAM TUBE IN TUBE PREHEAT COILS

- A. Acceptable manufacturers subject to compliance with the specifications shall be as follows:
  - 1. Aerofin
  - 2. Heat Craft
  - 3. Marlo
- B. Fins shall be continuous aluminum configured plate fin type, with full fin collars for accurate spacing and maximum fin tube contact with a maximum fins per inch. as scheduled. Minimum fin thickness shall be 0.010".
- C. Tubes shall be copper expanded into fin collars for permanent fin tube bond and expanded into header for leak tight joint at 300 psig air pressure under water. Headers shall be gray cast iron, hydrostatically tested to 400 psi before assembly. All standard coils shall be proof tested at 300 psig and leak tested at 200 psig air under water. Tubing and return bends shall be constructed from UNS 12200 seamless copper conforming to ASTM B75 and ASTM B251 for standard pressure applications. The 5/8" OD inner steam distributing tubes are centered in the outer 1 1/8" OD condensing tube. The inner tube has proportionally spaced directional steam jet orifices that direct the condensate flow to the outlet. Coils shall be suitable for 50 psig steam pressure.
- D. Casings shall be 16 gauge, continuous coated galvanized steel with fins recessed into channels to minimize air bypass, with 3/8" holes on 3" centers in top and bottom channels for mounting.

#### 2.15 COOLING COILS.

- A. Acceptable manufacturers subject to compliance with the specification shall be as follows:
  - 1. Aerofin
  - 2. Heat Craft
  - 3. Marlo
  - 4. Luvata
- B. Primary surface shall be round seamless 0.025" thick, 5/8" o.d. copper tubes on 1 1/2" centers, staggered in the direction of airflow. All joints shall be brazed. Tube bends shall be 0.035 thick.
- C. Secondary surface shall consist of aluminum plate type fins for higher capacity and structural strength. Fins shall have a minimum thickness of 0.0095" with full drawn collars to provide a continuous surface cover over the entire tube for maximum heat transfer with a maximum (10) fins per inch. Bare copper tube shall not be visible between fins. Fins shall have no openings punched in them so as to accumulate lint and dirt. Tubes shall be mechanically expanded into fins to provide a continuous primary to secondary compression bond over the entire finned length for maximum heat transfer rates. Tubes that have been expanded through the use of hydraulic expansion methods will not be acceptable.
- D. Cooling coil casing and tube supports shall be constructed of stainless steel with 3/8" diameter bolt holes for mounting on 8" centers. Casing shall be a minimum of 16 gauge, 304 stainless steel, reinforced flange of a minimum of 1 1/2" deep flange.

- E. Coil header shall be of copper materials using seamless copper tubing with intruded tube holes to permit expansion and contraction without creating undue stress or strain. Coil size shall be determined by coil manufacturer based upon the most efficient coil circuiting. Vent connections at the highest point to ensure proper venting and drain connections shall be provided at the lowest point to ensure complete drainage and prevent freeze-up.
- F. Coils shall have foam sealing strip located between casing channels and fins along top and bottom to arrest air bypass and water carryover.
- G. The complete coil core shall be pressure tested with 315 lbs. air pressure under warm water and shall be suitable for operation at 250 psig working pressure. Individual tube test and core tests before installation of headers will not be considered acceptable. Coils shall be circuited for drainability and for service without removing individual plugs from each tube. Use of internal restrictive devices to obtain turbulent flow will not be acceptable since they prevent complete draining of the coil.
- H. The manufacturer shall furnish coil capacities as outlined in the tabulation. Capacities shall be verified with an ARI approved computer selection method.
- I. The unit manufacturer shall provide separate drains from pan under each coil section. Drains from multiple, stacked coil pans shall be routed individually to drain outlet, not cascaded from one coil pan to the next lower pan.
- J. Coils shall be mounted to allow removal of any coil individually without disturbing any other coils, and shall be bolted off for removal.
- K. Drain pans and support members shall be stainless steel. Coil drain pans shall allow for condensate removal 3 inch upstream and 24 inch downstream of all coils.
- L. Each individual coil module shall have a limited height of up to 36".
- M. Coils shall be fully drainable with bottom of coil drain.

## 2.16 UVC EMITTERS

### A. General:

1. Acceptable Manufacturers:
  - a. Steril-Aire, Inc. Model DE Series as shown on Schedule or Drawings.
  - b. Substitutions: (10) day prior approval is required and is to include documentation by a recognized Industry Independent Testing Lab on UVC Emitter performances. Performance results must meet or exceed the performance for Emitters in an HVAC environment as detailed in Paragraphs A, 2.b, Paragraph B, Item 2, and Paragraph C, Items 3, 4 and 5.
2. Quality Assurance:
  - a. Qualifications: Each component and product is to be inbound and outbound tested before shipment under Mil Standard 105E and ANSI/ASQCZ 1.4
  - b. Output Verification: When tested in accordance with the general provisions of IES Lighting Handbook, 1981 Applications Volume, total output per one inch arc length shall not be less than 10  $\mu$ W/cm<sup>2</sup>, at one meter, in a 400 fpm airstream of 45° F
3. Warranty:



- a. Fixture and Emitter shall be warranted to be free from defects for a period of one year
- B. Design Requirements:
1. Irradiation - Emitters and fixtures are to be installed in sufficient quantity and in such an arrangement so as to provide an equal distribution of UVC energy on the coil and in the drain pan. To maintain energy efficiency, the UVC energy produced shall be of the lowest possible reflected and shadowed losses.
  2. Intensity - The minimal UVC energy striking the leading edge of all the coil fins shall not be less than 1400  $\mu\text{W}/\text{cm}^2$ . This sets the quantity of fixtures to be installed and their placement.
  3. Installation - Emitters and fixtures shall be installed downstream of the cooling coil at right angles to the coil fins, such that UVC energy bathes all surfaces of the coil and drain pan
- C. Equipment:
1. Units shall be high output, HVAC-type, germicidal UVC light sources, factory assembled and tested. Components shall include a housing, reflector, high efficiency electronic power source, Emitter sockets and boots, and Emitter tube, all constructed to withstand HVAC environments.
  2. DE Unit housings shall be made of 304 stainless steel, with DE Units having electrical connectors on both ends to simplify gang wiring and wiring to power. They shall include mounting holes to assist in securing the fixtures.
  3. DE reflectors shall be constructed of high spectral finished aluminum alloy with a minimum 85% reflectance of 254-nm UVC energy.
  4. High efficiency electronic power sources shall be 115 Vac/60/1. They shall be UL listed to comply with UL Standard 1995 and capable of igniting each Emitter at temperatures from 35 - 170° F in airflow velocities to 1000 fpm. They shall be equipped with RF and line noise suppression.
  5. Emitter tube shall be of the high output, hot cathode, T5 (15mm) diameter, and medium bi-pin type. They shall produce 95% of their energy at 254 nm and be capable of producing the specified output at airflow velocities to 1000 fpm at temperatures of 35 - 170° F. UVC Emitters shall produce no ozone or other secondary contamination.
- D. Installation of UVC Emitters
1. Emitters shall be installed and wired at the AHU manufacturer using an aluminum framing system provided by Steril-Aire.
  2. Provide an interlock switch on the access to the UVC Emitters to turn the lights off when the access is opened.
  3. Install provided Caution Labels on all accesses to the Emitters
- 2.17 OUTSIDE AIR MONITOR
- A. The monitor/controller shall be capable of direct measurement of airflow through an outside air inlet and provide an input to the building automation system that is linear to the measured airflow rate.
  - B. The monitor/controller shall measure inlet airflow with an accuracy of  $\pm 0.5\%$  of reading over a range of and within  $\pm 5\%$  for operating ranges as low as 100 fpm.
  - C. The monitor/controller shall interface with existing building management systems, accepting inputs for fan system start, economizer mode operation, and an external controller setpoint, and provide flow deviation alarm outputs.

- D. The sensors shall be constructed of materials that resist corrosion due to the presence of salt or chemicals in the air; all non-painted surfaces shall be constructed of stainless steel. The electronics enclosure shall be NEMA 1.
- E. The airflow measurement system shall be tested in accordance with AMCA Standard 610-06, Figure 4 and AMCA Standards 611-06 Certified Ratings program. The airflow measurement system shall bear the AMCA International certified ratings seal for airflow measurement station performance.
- F. Airflow monitor shall be by Ebtron or approved equal using Thermal Dispersion Technology.

#### 2.18 UNIT DISCHARGE SECTION

- A. Discharge section with exit velocities exceeding 1500 fpm shall be complete with aerodynamically designed framed discharge openings or spun bellmouth fittings in order to reduce overall system static pressures.
- B. Bellmouth fittings shall have minimum radius equal to 20% of the diameter (round or oval) or shortest side (rectangular) to provide optimum performance. Bellmouths with radius less than 2" are not acceptable. Bellmouth to be mounted flush with unit interior edge to minimize exit loss.
- C. Openings shall conform to the size and configuration of the ductwork where shown

### 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 AHUs.
- B. Examine roughing-in for AHUs to verify actual locations of piping and duct connections before equipment installation
- C. Proceed with installation only after unsatisfactory conditions have been corrected

#### 3.2 CONNECTIONS

- A. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain, sized with proper trap size per drawing details to ensure proper drainage.
- B. Install piping adjacent to AHU's to allow service and maintenance.
- C. Duct installation requirements are specified in other Division 15 Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements

#### 3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
- B. Perform tests and inspections and prepare test reports

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Report results in writing.
- C. Tests and Inspections:
1. After installing AHUs and after electrical circuitry has been energized, test units for compliance with requirements.
  2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
  3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment
  5. Test unit and controls under winter and summer conditions.
- D. Remove and replace malfunctioning units and retest as specified above.

### 3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
- B. Complete installation and startup checks according to manufacturer's written instructions and do the following:
1. Inspect for visible damage to unit casing.
  2. Inspect for visible damage to compressor, coils, and fans.
  3. Inspect internal insulation.
  4. Verify that labels are clearly visible.
  5. Verify that clearances have been provided for servicing.
  6. Verify that controls are connected and operable.
  7. Verify that filters are installed.
  8. Remove packing from vibration isolators.
  9. Retain first subparagraph below for barometric relief dampers
  10. Verify lubrication on fan and motor bearings.
  11. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
  12. Start unit according to manufacturer's written instructions
    - a. Complete startup sheets and attach copy with Contractor's startup report.
  13. Inspect and record performance of interlocks and protective devices; verify sequences.
  14. Operate unit for an initial period as recommended or required by manufacturer.
  15. Calibrate thermostats.
  16. Adjust and inspect high-temperature limits.
  17. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
  18. Inspect controls for correct sequencing of heating, dampers, cooling, and normal and emergency shutdown.
  19. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve
    - a. Supply-air volume, return air volume.
  20. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:
    - a. Low-temperature safety operation.
    - b. Filter high-pressure differential alarm.
    - c. Smoke and firestat alarms.

21. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters

### 3.5 CLEANING AND ADJUSTING

- A. After completing system installation and testing, adjusting, and balancing AHU and air-distribution systems, clean filter housings and install new filters.

### 3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain AHUs. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

## SECTION 238126

### SPLIT SYSTEM AIR CONDITIONERS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

##### 1.2 SUBMITTALS

- A. Product Data: For each unit indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- B. LEED Submittals:
  - 1. Product Data for Credit EA 4: Documentation required by Credit EA 4 indicating that equipment and refrigerants comply.
  - 2. Product Data for Prerequisite EQ 1: Documentation indicating that units comply with ASHRAE 62.1-2014, Section 5 - "Systems and Equipment."
- C. Operation and maintenance data.

##### 1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2014, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. ASHRAE/IESNA 90.1-2014 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2014, Section 6 - "Heating, Ventilating, and Air-Conditioning."

##### 1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace split-system air-conditioning units that fail in materials and workmanship within 5 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Daikin
  - 2. Mitsubishi
  - 3. Carrier
  - 4. Fujitsu
  - 5. Panasonic
  - 6. Friedrich Air Conditioning Company.

### 2.2 EVAPORATOR-FAN UNIT

- A. Concealed Unit Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
  - 1. Insulation: Faced, glass-fiber duct liner.
  - 2. Drain Pans: Galvanized steel, with connection for drain; insulated and complying with ASHRAE 62.1-2014.
  - 3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2014.
- B. Floor-Mounting, Unit Cabinet: Enameled steel with removable panels on front and ends.
  - 1. Discharge Grille: Steel with surface-mounted frame.
  - 2. Insulation: Faced, glass-fiber, duct liner.
  - 3. Drain Pans: Galvanized steel, with connection for drain; insulated and complying with ASHRAE 62.1-2014.
  - 4. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2014.
- C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.
- D. Water Coil: Copper-tube water coil, with mechanically bonded aluminum fins spaced no closer than 0.1 inch; leak tested to 300 psig underwater; and having a 2-position control valve.
- E. Electric Coil: Helical, nickel-chrome, electric-resistance heating elements with refractory ceramic support bushings; automatic-reset thermal cutout; built-in magnetic contactors; manual-reset thermal cutout; airflow proving device; and one-time fuses in terminal box for overcurrent protection.

- F. Evaporator Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
- G. Fan Motor: Multispeed.
- H. Filters: 1 inch thick, in fiberboard frames with ASHRAE 52.2 MERV rating of 6 or higher.

### 2.3 AIR-COOLED, COMPRESSOR-CONDENSER UNIT

- A. Casing steel, finished with baked enamel, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
- B. Compressor: Hermetically sealed scroll type with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
  - 1. Refrigerant: R-410A.
  - 2. Refrigerant: R-407C or R-410A.
- C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid sub-cooler.
- D. Heat Pump Components: Reversing valve and low-temperature air cut-off thermostat.
- E. Fan: Aluminum-propeller type, directly connected to motor.
- F. Motor: Permanently lubricated, with integral thermal-overload protection.
- G. Low Ambient Kit: Permits operation down to 45 deg F.
- H. Mounting Base: Polyethylene.
- I. Minimum Energy Efficiency: Comply with ASHRAE/IESNA 90.1-2014, "Energy Standard for Buildings except Low-Rise Residential Buildings."

### 2.4 ACCESSORIES

- A. Thermostat: Low voltage with subbase to control compressor and evaporator fan.
- B. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

- B. Install ground-mounted, compressor-condenser components on 4-inch thick, reinforced concrete base; 4 inches larger on each side than unit. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.
- C. Install ground-mounted, compressor-condenser components on polyethylene mounting base.
- D. Install compressor-condenser components on restrained, spring isolators with a minimum static deflection of 1 inch (25 mm). Refer to Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

### 3.2 CONNECTIONS

- A. Connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.
- B. Connect supply and return water coil with shutoff-duty valve and union or flange on the supply connection and with throttling-duty valve and union or flange on the return connection.
- C. Connect supply and return condenser connections with shutoff-duty valve and union or flange on the supply connection and with throttling-duty valve and union or flange on the return connection.
- D. Install piping adjacent to unit to allow service and maintenance.

### 3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
- C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new components, and retest.
- D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION 238126



## SECTION 260500

### COMMON WORK RESULTS FOR ELECTRICAL

#### PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS (Read these DIVISIONS carefully. For purposes of bidding, assume that all work of the DIVISION referenced is to be performed under that DIVISION unless specifically indicated therein to be performed under the ELECTRICAL DIVISION. Coordinate with all divisions to ensure a complete installation)
- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
  - B. Temporary wiring for building construction - see DIVISION 1.
  - C. Cutting and patching - see DIVISION 17
  - D. Allowances – see DIVISION 1.
  - E. Alternatives - see DIVISION 1.
  - F. Access panels - see DIVISION 8.
  - G. Temperature controls, temperature control wiring, interlock wiring, and boiler control wiring (except as indicated on the electrical drawings) - see DIVISION 23.
- 1.2 SUMMARY
- A. Section Includes:
    - 1. Work that applies to all sections of DIVISION 26.
    - 2. Temporary electrical wiring.
    - 3. Electrical equipment coordination and installation.
    - 4. Sleeves for raceways and cables.
    - 5. Common electrical installation requirements.
    - 6. Removals (demolition) and relocations
- 1.3 DEFINITIONS
- A. Provide: Furnish and install.
  - B. Wiring: Wire, raceways, boxes and fittings.
  - C. EPDM: Ethylene-propylene-diene-terpolymer rubber.
  - D. NBR: Acrylonitrile-butadiene rubber.

#### 1.4 SUBMITTALS

- A. Product Data: For sleeve seals.

#### 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. Do all wiring and provide all equipment in accordance with the prevailing issue of the National Electrical Code, State Building Code, State Fire Code, OSHA and any additional local rules or requirements.
- C. Obtain and pay for all necessary permits, certificates, etc. Present satisfactory proof of final inspection and approval by all inspection authorities.
- D. Consider the following Industry Standards as minimum requirements for all materials, equipment and systems where such standards are established for materials in question:
  - 1. National Board of Fire Underwriters
  - 2. National Electrical Manufacturers Association
  - 3. National Fire Protection Association
  - 4. Institute of Electrical and Electronic Engineers
  - 5. Local Electric Utility Company
  - 6. Local Telephone Company
  - 7. A nationally recognized testing laboratory (UL, ETL, etc.)
  - 8. Factory Mutual
  - 9. Americans with Disabilities Act
- E. Where applicable, this installation shall comply with the following NECA (National Electrical Contractors Association) "National Electrical Installation Standards." Except, if there is a conflict between this specification and these standards, the requirements of this specification shall prevail.
  - 1. NECA 1-2000                      Standard Practices for Good Workmanship in Electrical Contracting
  - 2. NECA 101-2001                  Standard for Installing Steel Conduit (Rigid, EMT)
  - 3. NECA/AA 104-2000              Recommended Practice for Installing Aluminum Building Wire and Cable
  - 4. NECA 400-1998                  Recommended Practice for Installing and Maintaining Switchboards
  - 5. NECA/EGSA 404-2000          Recommended Practice for Installing Generator Sets

6. NECA/IESNA 500-1998 Recommended Practice for Installing Indoor Commercial Lighting Systems
7. NECA/IESNA 501-2000 Recommended Practice for Installing Exterior Lighting Systems
8. NECA/IESNA 502-1999 Recommended Practice for Installing Industrial Lighting Systems

## 1.6 PROJECT CONDITIONS

- A. Interruption of Existing Services: All shutdowns of services (power, fire alarm, telephone, etc.) must be approved in writing by the Owner. Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
  1. Notify **Construction Manager and Owner** no fewer than **seven** days in advance of proposed interruption of electric service.
  2. Indicate method of providing temporary service.
  3. Do not proceed with interruption of any service without Construction Manager's written permission. All "shutdowns" must be done at other than normal working hours without additional compensation.
  4. Pay all utility charges related to "shutdowns", if any.
  5. All building services (power, fire alarm, telephone, lighting, emergency lighting, exit signs, etc.) must remain in operation during full period of construction. Provide temporary or permanent wiring (if required) to accomplish this.
  6. When an existing fire alarm system is modified or replaced with new, all existing devices must remain in operation until replaced with new devices that are fully tested, approved and operational. All non-functioning equipment shall be so labeled until it is removed or put into service.
- B. Comply with NFPA 70E.

## 1.7 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
  1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
  3. To allow right of way for piping and conduit installed at required slope.
  4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

- C. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment that requires positioning before closing in the building.
- D. Coordinate electrical service connections to components furnished by utility companies.

1.8 TEMPORARY ELECTRICAL WIRING: (Extended from existing building)

- A. Provide temporary electrical wiring of power and lighting for construction.
- B. Extend service from the electrical system of the existing building. However, if it is necessary to disrupt the existing service, provide new temporary service or generator. Do not overtax the service or distribution system. Provide a portable generator, if necessary.
- C. The Owner to pay the cost of energy consumed.
- D. The General Contractor to pay for the cost of energy consumed. Provide a three-phase check meter connected to serve all temporary wiring. Meter reading at start and finish of construction shall be recorded in the presence of a representative of the Owner.
- E. Service to be 120/208 volts, 3 phase, 4 wire (verify with the General Contractor before installation).
- F. Provide all required connections, panels, circuit breakers, feeders, branch circuit wiring, transformers, lighting fixtures, lamps, receptacles, switches, etc. for a complete and operating temporary electrical system.
- G. Provide a minimum of 10 footcandles of temporary general illumination throughout the floor area of the building, including all corridors and stairways.
- H. Existing lighting may be used where it is sufficient and remains energized.
- I. Provide feeders of sufficient capacity for the requirements of the work, sufficient number of outlets conveniently located so that extension cords not exceeding 100 feet will reach all work requiring artificial light or power.
- J. All receptacles must be GFCI protected and the entire installation must comply with all applicable OSHA requirements.
- K. At the end of the day's work, disconnect all lights and power, other than the minimum required security illumination.
- L. Provide replacement light bulbs and maintenance of the temporary wiring system, as required, throughout the period of construction.
- M. Conform to all codes and regulations.
- N. Completely remove temporary wiring system upon completion of construction.

#### 1.9 CHANGE ORDERS/PROPOSAL REQUESTS:

- A. During the course of construction, changes in the work may occur. When a significant change is to be made, a Proposal Request will be issued.
- B. Provide a complete cost breakdown when responding to each Proposal Request.
- C. Each item of work to be priced separately.
- D. Each line item to be broken down including quantities and listing separately labor and material.
- E. Both credits and extras shall be separately and clearly quantified.
- F. Allowances for overhead and profit shall be as listed in the supplementary conditions.
- G. If you become aware of a field condition, code requirement, error, or omission that you feel should result in a change to the work, please contact the Engineer for discussion. The Engineer may be able to clarify the situation and avoid unnecessary paperwork.
- H. It is recognized that the Owner benefits when the construction process is a cooperative effort instead of an adversarial relationship. Reasonable give-and-take allows the construction process to move smoothly. Your efforts in this regard will be appreciated by all parties.

#### 1.10 PACKAGED PRICES:

- A. It is in the facility owner's interest, that all bidders receive the best possible quotes on all materials during bidding so that any savings can result in a lower bid price. It is the policy of this Engineer not to specify brands that will result in "packaged" prices. Therefore, manufacturers' representatives are hereby notified that "packaged prices" are prohibited on this project. Upon request, suppliers are to provide bidders with complete material breakdown including each lighting fixture, system, component of system, each piece of equipment, etc. In keeping with this policy, Contractors are hereby cautioned not to anticipate deep discounts after the contract is awarded.

#### 1.11 INSPECTIONS/SITE OBSERVATIONS

- A. The authority having jurisdiction (usually the Municipal Electrical Inspector) shall be notified at periodic intervals that an inspection is requested. Inspections shall be requested at points of progress, meeting the approval of the inspector and as a minimum include the following:
  - 1. Prior to enclosing walls.
  - 2. Prior to enclosing ceilings.
  - 3. Prior to installation of panel/switchgear trims/covers.
  - 4. For observation of connections and grounding at switchboards, transformers and generators.

- B. Do not cover the work before the Engineer has had a chance to observe it in completed form. The electrical foreman shall request a meeting with the Engineer within 10 days after the start of electrical construction to assure that there is agreement on the scope of work and to answer questions.
- C. The electrical foreman shall provide assistance to the Engineer during site observations:
  1. Describe the progress of the electrical work in detail.
  2. Accompany the Engineer on his tour of the site, upon request.
  3. Provide use of a suitable ladder, scaffolding or bucket truck to observe the work, upon request.
  4. Remove ceiling tiles, panel trims, junction box covers, etc. for observation of the work, upon request.
  5. Provide use of project drawings, specifications and shop drawings.

#### 1.12 GUARANTEES/WARRANTIES:

- A. See other portions of the Project Manual for details on Guarantees and Warranties. However, minimum shall be one year from date of acceptance by the Engineer.
- B. The Owner reserves the right to make appropriate modifications or extensions of systems and equipment furnished under this contract during the guarantee/warranty period without "voiding" or modifying the guarantee/warranty of equipment and wiring installed under this contract. If manufacturer voids guarantee, it shall not relieve this contractor of his responsibilities for guarantee/warranty period.

#### 1.13 MISCELLANEOUS

- A. Provide all systems complete. Drawings and Specifications form complementary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both.
- B. Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for a sound, secure and complete installation.
- C. All wiring and connections shall be executed with associated circuit de-energized.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS - General:

- A. All materials and equipment shall be new unless specifically stated otherwise.
- B. Materials and equipment shall be suitable for their intended use and for the environment in which they are installed. For example, equipment located outside shall

be weatherproof and constructed of materials that will not rust. This includes brackets, screws, etc.

- C. Coordinate all dimensions to make sure that boxes, raceways, equipment, fixtures, etc., fit properly in the finished construction. If special provisions, such as shallow boxes, are required, they shall be provided at no increase in contract price, regardless of catalog numbers listed in contract documents or on shop drawings.
- D. As it is not practical to enumerate in these specifications (or show on the drawings) all details of fittings and accessory equipment required for proper operation of the various electrical systems herein described, it is understood that they will be supplied without extra compensation. Provide all fittings, terminations, relays, components of panels and equipment, etc., needed for the best performance possible at the present state-of-the-art.

## 2.2 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe", equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel.
  - 1. Minimum Metal Thickness:
    - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
    - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

## PART 3 - EXECUTION

### 3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- D. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

- E. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- F. Right of Way: Give to piping systems installed at a required slope.
- G. Record of Addenda and Change Orders: To avoid overlooking addenda and change order modifications, mark all changes on all copies of drawings and specifications, in a manner acceptable to the Engineer. One method of accomplishing this is to make copies and tape them on the back of the preceding page (tape all edges). Also, circle the changed area and note: see addenda #1, etc. If whole pages or sheets change, either remove the superseded document or put a bold "X" through it.
- H. Record Drawings: Owner's record drawings shall be updated as the project progresses. Maintain documents in a safe, dry location. Indicate clearly and accurately any changes necessitated by field conditions and dimension all raceways built into or under concrete slabs or buried under ground. Contractor to prepare as-built drawings in CAD format at contractor's expense. Contract drawings in CAD format to be furnished to contractor at no cost to contractor. Contractor to provide two compact discs and two hard copies of final as-built drawings.
- I. Operating Instructions and Manuals: Provide the Owner or his representative with complete operating instructions by qualified personnel of all electrical systems. Provide three (3) bound sets (indexed and bound in three sturdy three-ring binders) of operating and maintenance instructions of all electrical systems employed and all shop drawings.
- J. Letter of Confirmation: Include in the above manuals a letter confirming that the following items have been completed. Provide written receipt signed by the Owner or his representative indicating that the first 4 items listed below have been received.
  - 1. The number of circuit breaker locks called for have been provided.
  - 2. Keys have been provided for all locked electrical equipment.
  - 3. The provisions of the "Operating Instructions and Manuals" paragraph of these specifications have been met.
  - 4. Spare fuses have been provided.
  - 5. A TV set matching cable has been provided for each outlet plus spares as called for.
  - 6. The lightning protection system "Master Label" has been provided.
  - 7. A nurse call cord has been provided for each station outlet plus spares as called for.
  - 8. Identification is complete and in accordance with these specifications.
  - 9. As-built electrical drawings have been completed and submitted.
  - 10. All tests are complete and in accordance with these specifications.
  - 11. All required shop drawings have been submitted and approved.
  - 12. The entire installation has been accepted by all authorities.

### 3.2 SEQUENCE AND BALANCE:



- A. Maintain correct phase sequence of all feeders and circuits by establishing phase identification and maintaining correct relationship throughout the system. Provide line balance within 10% of normal loads.

### 3.3 LAYOUTS

- A. The electrical system layouts indicated are generally diagrammatic and locations of outlets and equipment are approximate only; govern exact routing of wiring and locations of outlets and equipment by structural conditions and obstructions. This is not to be construed to permit redesigning systems. Interconnect as shown.
- B. Locate all equipment requiring maintenance and operation so that it will be readily accessible. The right is reserved to make any reasonable change in location of outlets and equipment prior to roughing-in without involving additional expense. This may involve slightly longer wiring runs, longer stems, additional mounting provisions, etc. Allow for this in your bid because additional compensation will not be provided. Items not specifically located on the plans shall (for the purposes of bidding) be assumed to be in the farthest, most difficult location. Exact location to be as directed in the field.

### 3.4 ELECTRICAL SERVICE: (Existing)

- A. Existing electrical service shall remain.
  - 1. Service voltage is 120/208 volts, three phase, four wire.

### 3.5 Conform to all requirements of the local electrical utility company, municipality and state

### 3.6 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Rectangular Sleeve Minimum Metal Thickness:
  - 1. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side greater than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
  - 2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches (1270 mm) and 1 or more sides equal to, or greater than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

- E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- F. Cut sleeves to length for mounting flush with both surfaces of walls.
- G. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.
- H. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable (unless sleeve seal is to be installed), unless seismic criteria require different clearance, or indicated otherwise.
- I. Seal space outside of sleeves with grout for penetrations of concrete and masonry, and with approved joint compound for gypsum board assemblies.
  - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
- K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. In compliance with wall fire rated assembly requirements and industry standards.

### 3.7 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

### 3.8 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. In compliance with wall fire rated assembly requirements and industry standards.
- B. Penetrations through exterior surfaces shall be made watertight.
- C. Floor boxes, fed from floor below, shall be fire-rated, poke-through type with UL labeled fire rating to match floor rating.

### 3.9 WORK INTERFERING WITH EXISTING WIRING:

- A. Make any necessary re-circuiting, extensions of existing circuits and relocations required to properly re-energize remaining existing devices or equipment that may be interfered with by new construction or removals.

### 3.10 REMOVALS (DEMOLITION) AND RELOCATIONS:

- A. Coordinate with DIVISION 2 section "Selective Demolition."
- B. Do all removal work in a neat and orderly manner so as not to endanger lives nor cause damage. Removal work to include all associated hangers, couplings, supports, raceway and wiring, etc., and shall be complete in every way.
- C. Remove and dispose of, off-site in a legal manner, all raceways and wire indicated to be removed.
- D. Carefully remove and store on-site, where directed by the Owner, all electrical equipment indicated to be REMOVED. After the Owner has examined this equipment, remove and dispose of, off-site in a legal manner, all of this equipment that the Owner does not want. All remaining equipment shall remain the property of the Owner. Relocate the remaining equipment to a permanent storage location on site where directed by the Owner.
- E. The electrical removal (demolition) drawings show the general extent of removals. However it is impractical to show every item; some of which may be concealed. Therefore, assume that you will be required to perform an additional 10% of removal work, without additional compensation. Items not shown to be removed or to remain shall remain or be removed, as directed.
- F. Prior to removing any electrical equipment, properly de-energize all associated wiring. Remove wires from terminals of supply switches or circuit breakers. Properly tape supply and load end conductors of all wiring remaining and not re-used. Properly tag both ends.
- G. Provide outlet boxes, knock-out seals, receptacle cover plates, etc. to leave remaining installation in finished condition.
- H. Take special care in removing equipment indicated to be RELOCATED and properly and thoroughly clean and lubricate this equipment. Renew fuses and overload elements in starters and switches being relocated, if required to properly serve the new installation.
- I. Adjust outlet and junction boxes as required to suit new finished surfaces.
- J. When necessary to perform your work, carefully remove ceiling tiles and properly re-install them. Make sure that hands are clean and take special care to avoid damage. If tiles become damaged, provide new tiles to exactly match existing. If existing tiles have yellowed with age, it may be necessary to relocate existing undamaged tiles from utility spaces (closets, etc.) and install new tiles in their place.

- K. For relocation of lighting fixtures, see sections entitled "Interior Lighting" and "Exterior Lighting."
- L. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.
- M. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.
- N. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches (50 mm) below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.
- O. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

### 3.11 CUTTING AND PATCHING

- A. This trade (specification section) is responsible for its respective cutting and patching.
- B. Do not endanger any work by cutting or altering work or any part of it.
- C. Do not cut or alter work of another Contractor without written consent of the Engineer.
- D. Prior to cutting which affects structural safety of project, or work of another Contractor, submit written notice to the Engineer, requesting consent to proceed with cutting.
- E. Perform all work of fitting, adjustment, cutting, patching, finishing and restoration to perfectly match the quality as specified throughout these specifications. Painting shall match and be feathered into adjacent surfaces.

### 3.12 CORE DRILLING:

- A. All holes through masonry surfaces must be "core drilled". This trade (specification section) is responsible for its respective core drilling, if any.
- B. Do not endanger any work by drilling or altering work or any part of it.
- C. Do not drill or alter work of another Contractor without written consent of the Engineer.
- D. Prior to drilling which affects structural safety of project, or work of another Contractor, submit written notice to the Engineer, requesting consent to proceed with cutting.
- E. Perform all work of core drilling to perfectly match the quality as specified throughout these specifications.

3.13 ACCESS PANELS:

- A. This trade (specification section) is responsible for determining the number of access panels required for existing and new electrical work (including one under each above ceiling thermodetector) and furnishing them to the mason or drywall contractor for installation. See DIVISION 8.

3.14 CLEANING, PAINTING AND REFINISHING:

- A. Paint all new plywood backboards on all sides and edges before mounting.
- B. Thoroughly clean all new electrical equipment, devices and enclosures upon completion of all work.
- C. Refinish any new electrical equipment whose finish is damaged or rusted, as determined by the Engineer.

END OF SECTION 260500

## SECTION 260519

### LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600V-COPPER ONLY)

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Specification Section 260500 Common Work Results For Electrical.

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Building wires and cables rated 600 V and less.
  - 2. Connectors, splices, and terminations rated 600 V and less.
  - 3. Sleeves and sleeve seals for cables.
- B. Related Sections include the following:
  - 1. Division 26 Section "Medium-Voltage Cables" for single-conductor and multiconductor cables, cable splices, and terminations for electrical distribution systems with 2001 to 35,000 V.
  - 2. Division 26 Section "Undercarpet Electrical Power Cables" for flat cables for undercarpet installations.
  - 3. Division 27 Section "Communications Horizontal Cabling" for cabling used for voice and data circuits.

##### 1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

##### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.
- C. Field quality-control test reports.

##### 1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the

InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
  - B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
  - C. Comply with NFPA 70.
- 1.6 COORDINATION
- A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

## PART 2 - PRODUCTS

### 2.1 CONDUCTORS AND CABLES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. Alcan Products Corporation; Alcan Cable Division.
  2. American Insulated Wire Corp.
  3. General Cable Corporation.
  4. Southwire Company.
  5. Equal approved by Engineer.
- B. All conductors, insulation, and cables shall comply with NEMA WC 70.
- C. Conductor Material: Copper complying with NEMA WC 5 solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.
- D. Conductor Insulation Types: Type THHN-THWN or XHHW complying with NEMA WC 5.
- E. Multiconductor Cable: Metal-clad cable, Type MC.

### 2.2 CONNECTORS AND SPLICES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
  1. AFC Cable Systems, Inc.
  2. Hubbell Power Systems, Inc.
  3. O-Z/Gedney; EGS Electrical Group LLC.
  4. 3M; Electrical Products Division.

- 5. Tyco Electronics Corp.
- 6. Equal approved by Engineer.

B. Description: Spring-type factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

C. Do not use push-in type wire connectors, use spring type instead.

### 2.3 SLEEVES AND SLEEVE SEALS:

See Specification Section 260500/2.1 & 2.2.

## PART 3 - EXECUTION

### 3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

### 3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN, single conductors in raceway, or Mineral-insulated, metal-sheathed cable, Type MI.

B. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway, Metal-clad cable, Type MC, or Mineral-insulated, metal-sheathed cable, Type MI.

C. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

D. Branch Circuits in Cable Tray: Type THHN-THWN, single conductors in raceway, Metal-clad cable, Type MC, or Mineral-insulated, metal-sheathed cable, Type MI.

E. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

F. Fire Alarm Circuits: See drawings.

G. Class 1 Control Circuits: Type THHN-THWN, in raceway.

H. Class 2 Control Circuits: Type THHN-THWN, in raceway, Power-limited cable, concealed in building finishes, or Power-limited tray cable, in cable tray.

### 3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.



Confirm conduit ID and that conduit will be at or below 40% filled. Confirm jam ratios and take precautions when pulling.

- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- G. Seal around cables penetrating fire-rated elements according to Division 7 Section "Through-Penetration Firestop Systems."
- H. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.
- I. Where the number of current-carrying conductors in a raceway or cable exceeds three, the allowable ampacity shall be reduced per NEC table based on no diversity. Consider neutrals to be current carrying conductors.

### 3.4 CONNECTIONS

- A. Make all final connections required for a complete and fully operational facility.
- B. Wiring connections to equipment shall include connections to all accessories. For example, if a fan has an associated damper, the wiring must be extended from the fan to the damper at no additional charge. Another example is interconnection of equipment. Some items of equipment consist of several pieces, which must be interconnected before connecting to the circuit. No additional compensation will be paid for interconnections.
- 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.
- D. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- E. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.
- F. Locations of junction boxes, stub-ups and disconnects are diagrammatic. At the time of design, the exact brand of equipment is usually not known. Therefore, the exact locations of connections are not known. For the purposes of bidding assume the worst, farthest locations. During construction, coordinate connections with final

approved shop drawings and coordinate with other trades. Conform to manufactures written installation instructions. Provide working space in compliance with code.

### 3.5 FIELD QUALITY CONTROL

- A. All cables installed under this contract are to be protected from damage prior to installation, during installation, and after installation. Store cable in a dry area protected from physical damage. Before installing cable, raceway shall be clear, dry and free from burs or sharp edges. When cables pass through metal partitions, provide permanently installed insulating bushings; this applies to all cables installed under this contract (systems, communications, etc.). Insulated bushings are to be installed prior to pulling in of cable. Cables shall be installed back from edge of studs as required by Code.

END OF SECTION 260519

## SECTION 260526

### GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. This Section includes methods and materials for grounding systems and equipment.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency and testing agency's field supervisor.
- C. Field quality-control test reports.

##### 1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

#### PART 2 - PRODUCTS

##### 2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable, insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
  - 1. Solid Conductors: ASTM B 3.
  - 2. Stranded Conductors: ASTM B 8.

##### 2.2 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

## PART 3 - EXECUTION

### 3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

### 3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
  - 1. Branch circuits.
  - 2. Lighting circuits.
  - 3. Receptacle circuits.
  - 4. Single-phase motor and appliance branch circuits.
  - 5. Three-phase motor and appliance branch circuits.
  - 6. Flexible raceway runs.
  - 7. Armored and metal-clad cable runs.

### 3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

### 3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Electrical contractor shall verify continuity of all new branch circuit equipment grounds.

END OF SECTION 260526

## SECTION 260529

### HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Hangers and supports for electrical equipment and systems.
  - 2. Construction requirements for concrete bases.
- B. Related Sections include the following:
  - 1. Division 26 Section "Vibration and Seismic Controls For Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

##### 1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

##### 1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

## 1.5 SUBMITTALS

- A. Product Data: For the following:
  - 1. Metallic slotted support systems.
  - 2. Nonmetallic slotted support systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
  - 1. Trapeze hangers. Include Product Data for components.
  - 2. Steel slotted channel systems. Include Product Data for components.
  - 3. Nonmetallic slotted channel systems. Include Product Data for components.
  - 4. Equipment supports.
- C. Welding certificates.

## 1.6 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

## 1.7 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

## PART 2 - PRODUCTS

### 2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Flange edges turned toward web, and 9/16-inch- (14-mm-) diameter slotted holes at a maximum of 2 inches (50 mm) o.c., in webs. Strength rating to suit structural loading. Comply with MFMA-4, factory-fabricated components for field assembly.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
    - a. Allied Tube & Conduit.
    - b. Cooper B-Line, Inc.; a division of Cooper Industries.
    - c. ERICO International Corporation.
    - d. GS Metals Corp.
    - e. Thomas & Betts Corporation.
    - f. Unistrut; Tyco International, Ltd.
    - g. Wesanco, Inc.

- h. Equal approved by Engineer.
  - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
  - 3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
  - 4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
  - 5. Channel Dimensions: Selected for applicable load criteria.
- B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least 1 surface.
- 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
    - a. Allied Tube & Conduit.
    - b. Cooper B-Line, Inc.; a division of Cooper Industries.
    - c. Fabco Plastics Wholesale Limited.
    - d. Seasafe, Inc.
    - e. Equal approved by Engineer.
  - 2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
  - 3. Fitting and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
  - 4. Rated Strength: Selected to suit applicable load criteria.
- C. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers. As described in NECA 1 and NECA 101.
- D. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron with hot-dip galvanized finish..
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
  - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
    - 1) Hilti Inc.
    - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
    - 3) MKT Fastening, LLC.
    - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
    - 5) Equal approved by Engineer.
  
2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
  - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
    - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
    - 2) Empire Tool and Manufacturing Co., Inc.
    - 3) Hilti Inc.
    - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
    - 5) MKT Fastening, LLC.
    - 6) Equal approved by Engineer.
  
3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

## 2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.



## PART 3 - EXECUTION

### 3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems, except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
  - 1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

### 3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Support individual horizontal single raceways with separate, malleable-iron pipe hangers or clamps except use spring-steel fasteners for 1-1/2-inch (38-mm) and smaller single raceways above suspended ceilings and for fastening raceways to slotted channel and angle supports.
- C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
- D. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- E. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads (+25 percent minimum) within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- F. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  - 1. To Wood: Fasten with lag screws or through bolts.

2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts, or beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
9. Fasteners: Select so load applied to each fastener does not exceed 25 percent of its proof-test load.

- G. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

### 3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

### 3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi (20.7-MPa, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete (Limited Applications)."
- C. Anchor equipment to concrete base.
  1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  2. Install anchor bolts to elevations required for proper attachment to supported equipment.
  3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

### 3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

## SECTION 260533

### RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
  - 1. Division 26 Section "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

##### 1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. EPDM: Ethylene-propylene-diene terpolymer rubber.
- D. FMC: Flexible metal conduit.
- E. IMC: Intermediate metal conduit.
- F. LFMC: Liquidtight flexible metal conduit.
- G. LFNC: Liquidtight flexible nonmetallic conduit.
- H. NBR: Acrylonitrile-butadiene rubber.
- I. RNC: Rigid nonmetallic conduit.
- J. RGS: Rigid galvanized steel conduit.

##### 1.4 SUBMITTALS

- A. Product Data: For surface raceways, wireways, fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.

1. Custom enclosures and cabinets.
  2. For handholes and boxes for underground wiring, including the following:
    - a. Duct entry provisions, including locations and duct sizes.
    - b. Frame and cover design.
    - c. Grounding details.
    - d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
    - e. Joint details.
- C. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
1. Structural members in the paths of conduit groups with common supports.
  2. HVAC and plumbing items and architectural features in the paths of conduit groups with common supports.
- D. Manufacturer Seismic Qualification Certification: Submit certification that enclosures and cabinets and their mounting provisions, including those for internal components, will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    - a. The term "withstand" means "the cabinet or enclosure will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will retain its enclosure characteristics, including its interior accessibility, after the seismic event."
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- E. Qualification Data: For professional engineer and testing agency.
- F. Source quality-control test reports.
- 1.5 QUALITY ASSURANCE
- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
  - B. Comply with NFPA 70.

## PART 2 - PRODUCTS

### 2.1 METAL CONDUIT AND TUBING

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
1. AFC Cable Systems, Inc.
  2. Alflex Inc.
  3. Allied Tube & Conduit; a Tyco International Ltd. Co.
  4. Anamet Electrical, Inc.; Anaconda Metal Hose.
  5. Electri-Flex Co.
  6. Manhattan/CDT/Cole-Flex.
  7. Maverick Tube Corporation.
  8. O-Z Gedney; a unit of General Signal.
  9. Wheatland Tube Company.
  10. Equal approved by Engineer.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Aluminum Rigid Conduit: ANSI C80.5.
- D. IMC: ANSI C80.6.
- E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
1. Comply with NEMA RN 1.
  2. Coating Thickness: 0.040 inch (1 mm), minimum.
- F. EMT: ANSI C80.3.
- G. FMC: Zinc-coated steel.
- H. LFMC: Flexible steel conduit with PVC jacket.
- I. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
  2. Fittings for EMT: Steel, set-screw type.
  3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- J. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

## 2.2 NONMETALLIC CONDUIT AND TUBING

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. AFC Cable Systems, Inc.

2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corp.; Pipe & Plastics Group.
6. Condux International, Inc.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; a Hubbell Company.
12. Thomas & Betts Corporation.
13. Equal approved by Engineer.

B. ENT: NEMA TC 13.

C. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.

D. LFNC: UL 1660.

E. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

F. Fittings for LFNC: UL 514B.

## 2.3 OPTICAL FIBER/COMMUNICATIONS CABLE RACEWAY AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

1. Arnco Corporation.
2. Endot Industries Inc.
3. IPEX Inc.
4. Lamson & Sessions; Carlon Electrical Products.
5. Equal approved by Engineer.

B. Description: Comply with UL 2024; flexible type, approved for plenum, riser, or general-use installation, as needed.

## 2.4 METAL WIREWAYS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.
4. Equal approved by Engineer.

- C. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, 12, or 3R, as indicated or required by environmental conditions.
- D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- E. Wireway Covers: Hinged type, screw-cover type, or flanged-and-gasketed type, as indicated.
- F. Finish: Manufacturer's standard enamel finish.

## 2.5 NONMETALLIC WIREWAYS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
  - 1. Hoffman.
  - 2. Lamson & Sessions; Carlon Electrical Products.
  - 3. Equal approved by Engineer.
- B. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.
- C. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.
- D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

## 2.6 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Architect.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Thomas & Betts Corporation.
    - b. Walker Systems, Inc.; Wiremold Company (The).
    - c. Wiremold Company (The); Electrical Sales Division.
    - d. Equal approved by Engineer.



## 2.7 BOXES, ENCLOSURES, AND CABINETS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
  2. EGS/Appleton Electric.
  3. Erickson Electrical Equipment Company.
  4. Hoffman.
  5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
  6. O-Z/Gedney; a unit of General Signal.
  7. RACO; a Hubbell Company.
  8. Robroy Industries, Inc.; Enclosure Division.
  9. Scott Fetzer Co.; Adalet Division.
  10. Spring City Electrical Manufacturing Company.
  11. Thomas & Betts Corporation.
  12. Walker Systems, Inc.; Wiremold Company (The).
  13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.
  14. Equal approved by Engineer.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- E. Metal Floor Boxes: Cast metal, fully adjustable, rectangular.
- F. Nonmetallic Floor Boxes: Nonadjustable, round.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- H. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- I. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- J. Cabinets:
1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
  2. Hinged door in front cover with flush latch and concealed hinge.
  3. Key latch to match panelboards.
  4. Metal barriers to separate wiring of different systems and voltage.
  5. Accessory feet where required for freestanding equipment.

## 2.8 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

### A. Description: Comply with SCTE 77.

1. Color of Frame and Cover: Green.
2. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, as indicated for each service.
6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
7. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

### B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
  - a. Armorcast Products Company.
  - b. Carson Industries LLC.
  - c. CDR Systems Corporation.
  - d. NewBasis.
  - e. Equal approved by Engineer.

## 2.9 SLEEVES FOR RACEWAYS

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section on penetration firestopping.

## 2.10 SLEEVE SEALS

1. See Section 260500.

## 2.11 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

- A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
1. Tests of materials shall be performed by an independent testing agency.
  2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
  3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

## PART 3 - EXECUTION

### 3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
1. Exposed Conduit: Rigid steel conduit.
  2. Concealed Conduit, Aboveground: EMT.
  3. Underground Conduit, over 600 volts: RNC, Type EPC-80-PVC, direct buried.
  4. Underground Conduit, under 600 volts: RNC, Type EPC-40-PVC, direct buried.
  5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): In dry conditions, use FMC. Use LFMC in damp, wet, or dirty conditions.
  6. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R or 4, as indicated.
  7. Application of Handholes and Boxes for Underground Wiring:
    - a. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.
    - b. Handholes and Pull Boxes in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer-concrete units, SCTE 77, Tier 8 structural load rating.
    - c. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf (13 345-N) vertical loading.
- B. Comply with the following indoor applications, unless otherwise indicated:
1. Exposed, Not Subject to Physical Damage: EMT.
  2. Exposed and Subject to Physical Damage: Rigid steel conduit. Includes raceways in the following locations:
    - a. Loading dock.
    - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    - c. Mechanical rooms.
    - d. Per drawings.

3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp, wet, or dirty locations.
5. Damp or Wet Locations: Rigid steel conduit.
6. Raceways for Optical Fiber or Communications Cable in Spaces Used for Environmental Air: EMT.
7. Raceways for Optical Fiber or Communications Cable Risers in Vertical Shafts: EMT.
8. Raceways for Concealed General Purpose Distribution of Optical Fiber or Communications Cable: EMT.
9. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in corrosive locations.

C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits in contact with concrete.

### 3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 12 inches (300 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

- H. Raceways Embedded in Slabs:
1. Run conduit larger than 2-inch (54-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
  2. Arrange raceways to cross building expansion joints at right angles; with expansion fittings.
  3. Change from Type EPC-40-PVC, to rigid steel conduit before rising above the floor.
- I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors of all sizes.
- K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.
- L. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:
1. 3/4-Inch (19-mm) Trade Size and Smaller: Install raceways in maximum lengths of 50 feet (15 m).
  2. 1-Inch (25-mm) Trade Size and Larger: Install raceways in maximum lengths of 75 feet (23 m).
  3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.
- M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated or heated spaces.
  2. Where otherwise required by NFPA 70.
- N. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run length that exceeds 25 feet (7.6 m).
1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:
    - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.

- b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
  - c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
  - d. Attics: 135 deg F (75 deg C) temperature change.
2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change.
  3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.
- O. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semi-recessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject.
- P. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.
- Q. Set metal floor boxes level and flush with finished floor surface.
- R. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

### 3.3 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earth Moving" for pipe less than 6 inches (150 mm) in nominal diameter.
  2. Install backfill as specified in Division 31 Section "Earth Moving."
  3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."
  4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
    - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
    - b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

5. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried conduits, placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of conduit.

#### 3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.
- D. Install handholes and boxes with bottom below the frost line; or 40 inches below grade.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.
- F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

#### 3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. See Section 260500.

#### 3.6 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
  1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

## SECTION 260553

### IDENTIFICATION FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. Section Includes:
  - 1. Identification for raceways.
  - 2. Identification of power and control cables.
  - 3. Identification for conductors.
  - 4. Equipment identification labels.
  - 5. Miscellaneous identification products.

##### 1.3 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

##### 1.4 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

##### 1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.



## PART 2 - PRODUCTS

### 2.1 POWER RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
  - 1. Black letters on a yellow field.
  - 2. Legend: Indicate voltage.
- C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

### 2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Colors for Raceways Carrying Circuits at 600 V and Less:
  - 1. Black letters on a yellow field.
  - 2. Legend: Indicate voltage.
- C. Indoor: Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- D. Outdoor: Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

### 2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

### 2.4 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

### 2.5 CABLE TIES

- A. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
  - 1. Minimum Width: 3/16 inch (5 mm).

2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 7000 psi (48.2 MPa).
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Black.

## 2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- F. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
  1. Outdoors: UV-stabilized nylon.
  2. In Spaces Handling Environmental Air: Plenum rated.
- G. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

### 3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30A, and 120V to ground: Identify with self-adhesive vinyl label. Install labels at 10-foot (3-m) maximum intervals.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Optional Standby Power.
  2. Power.
  3. Fire Alarm.
  4. Low Voltage.
  5. UPS Power.
- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.
    - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
    - b. Colors for 208/120-V Circuits:
      - 1) Phase A: Black.
      - 2) Phase B: Red.
      - 3) Phase C: Blue.
      - 4) Neutral: White
      - 5) Ground: Green
      - 6) Isolated Ground: Green w/trace ID
    - c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- D. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box.
- E. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
  2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
  3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- F. At each pull box, junction box and outlet box, each circuit contained therein shall be identified by panel designation and circuit number. This shall be accomplished by attaching hand written cardboard labels with string to each set of wires or by other agreed upon methods. In addition, where boxes are concealed, covers shall be marked with the same information using magic marker or other agreed upon means.

- G. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
    - a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
    - b. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    - c. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
  2. Equipment to Be Labeled:
    - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Information shall include circuit numbers, type of load served and location of load served. For example: #1 Receptacles in rooms 5 & 6. Panelboard identification shall be engraved, laminated acrylic or melamine label.
    - b. Enclosures and electrical cabinets.
    - c. Lighting control equipment.

END OF SECTION 260553

## SECTION 262726

### WIRING DEVICES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
  - 2. Twist-locking receptacles.
  - 3. Wall-box motion sensors.
  - 4. Snap switches and wall-box dimmers.
  - 5. Solid state fan speed controls.
  - 6. Wall-switch sensors.
  - 7. Cord and plug sets.
  - 8. Multioutlet assemblies.
  - 9. Device trim plates.
- B. Related Sections include the following:
  - 1. Division 27 Section "Communications Horizontal Cabling" for workstation outlets.

##### 1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. TVSS: Transient voltage surge suppressor.
- F. UTP: Unshielded twisted pair.

##### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.

- D. Field quality-control test reports.
- E. Operation and Maintenance Data: Include all manufacturers' packing label warnings and instruction manuals.

#### 1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

#### 1.6 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
- B. Provide additional receptacles to suit the particular equipment served.
- C. Cord and Plug Sets: Match equipment requirements.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Wiring Devices:
    - a. General Electric Company
    - b. Bryant Electric, Inc./Hubbell Subsidiary.
    - c. Hubbell Incorporated; Wiring Device-Kellems.
    - d. Leviton Mfg. Company Inc.
    - e. Pass & Seymour/Legrand; Wiring Devices Div.
    - f. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper)
  - 2. Multioutlet Assemblies:
    - a. Hubbell Incorporated; Wiring Device-Kellems.
    - b. Wiremold Company (The).
    - c. Equal approved by Engineer.
  - 3. Poke-Through, Floor Service Outlets and Telephone/Power Poles:
    - a. Hubbell Incorporated; Wiring Device-Kellems.
    - b. Pass & Seymour/Legrand; Wiring Devices Div.
    - c. Thomas & Betts Corporation.

- d. Wiremold Company (The).
- e. Equal approved by Engineer.

2.2 RECEPTACLES

A. General

1. Comply with NEMA WD 1, NEMA WD 6, and UL 498.
2. Provide additional receptacles to suit the particular equipment served.
3. Provide other special duty receptacles as indicated on the drawings.
4. Receptacles mounted outdoors or in other wet or damp locations shall be GFI type and installed in weatherproof enclosures, the integrity of which is not affected when the receptacle is in use (attachment plug cap inserted). Also comply with UL 943, Class A, and include indicator light that is lighted when device is tripped.
5. Color as selected by Architect, or as noted.
6. Catalog numbers are for General Electric Company, or as noted.
7. Isolated-Ground, Duplex Convenience Receptacles: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

B. Provide 20 amp. commercial specification grade, grounded, DUPLEX RECEPTACLES.

20A/125V	Duplex Receptacle	GE #GCR-20
20A/125V	Single Receptacle	GE #4102
30A/125V/250V	4 Wire Receptacle	GE #1439-3
50A/125V/250V	4 Wire Receptacle	GE #4181-3
20A/125V	Duplex Receptacle	GE #5362-IG (Isolated Ground)
20A/125V	Single Receptacle	GE #4102-IG (Isolated Ground)
20A/125V	GFI Dup. Rec.	GE #GFR 5342

C. Provide Wiring Devices for HAZARDOUS (Classified) Locations: Comply with NEMA FB 11 and UL 1010.

D. Provide TWIST-LOCKING RECEPTACLES: Provide single convenience receptacles where indicated.

E. Provide CORD AND PLUG SETS

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.3 SWITCHES

A. GENERAL

1. Comply with NEMA WD 1 and UL 20.

- B. Provide 20 amp., toggle type, "Federal Specification Grade" lighting switches.

Single pole	GE #5951	Three-way	GE #5953
Double pole	GE #5952	Four-way	GE #5954

- C. Provide heavy duty, specification grade, 20 amp., quiet "AC", "DECORA" TOUCH SWITCHES. Catalog numbers are for Slater Medalist Decora Series.

Single pole	2770	Three-way	2773
Double pole	2772	Four-way	2774

- D. Provide Pilot Light Switches, 20 A, single pole, with neon-lighted handle, illuminated when switch is "ON."
- E. Provide Key-Operated Switches, 120/277 V, 20 A, Single pole, with factory-supplied key in lieu of switch handle.
- F. Provide Key-Operated, Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.
- G. Provide FAN SPEED CONTROLS: Modular, 120-V, full-wave, solid-state units with integral, quiet on-off switches and audible frequency and EMI/RFI filters. Comply with UL 1917.
1. Continuously adjustable rotary knob, 5 A.
- H. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible frequency and EMI/RFI filters, unless otherwise indicated on the drawings.
1. Control: Continuously adjustable combination slider and toggle switch with single-pole or three-way switching to suit connections. Comply with UL 1472.
- I. Occupancy Sensors
1. As indicated on the drawings.
- J. Wall-Switch Sensors:
1. As indicated on the drawings.

## 2.4 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
1. Plate-Securing Screws: Metal with head color to match plate finish.
  2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
  3. Material for Unfinished Spaces: Galvanized steel.
  4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."



- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, polycarbonate with lockable cover.
- C. Single and combination types to match corresponding wiring devices.
  - 1. Plate-Securing Screws: Metal with head color to match plate finish.
  - 2. Provide smooth (unribbed) high-impact thermoplastic switch and receptacle cover plates. Color as selected by Architect.
  - 3. Receptacles mounted outdoors or in other wet or damp locations shall be installed in weatherproof enclosures with key lock cover, the integrity of which is not affected when the receptacle is in use (attachment plug cap inserted).

## 2.5 MULTIOUTLET ASSEMBLIES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
  - 1. Hubbell Incorporated; Wiring Device-Kellems.
  - 2. Wiremold Company (The).
  - 3. Panduit Corp.
  - 4. Equal approved by Engineer.
- B. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.
- C. Raceway Material: Metal, with manufacturer's standard finish.

## 2.6 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
  - 1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70 or device listing.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
  - 1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes.
  - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
  - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  - 4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
  - a. Cut back and pigtail, or replace all damaged conductors.
  - b. Straighten conductors that remain and remove corrosion and foreign matter.
  - c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
10. Install devices and assemblies level, plumb, and square with building lines.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening. Remove wall plates and protect devices and assemblies during painting.

G. Dimmers:

1. Install dimmers within terms of their listing.
  2. Verify that dimmers used for fan speed control are listed for that application.
  3. Install unshared neutral conductors on line and load side of dimmers.
  4. Install wall dimmers to achieve indicated rating after derating for ganging.
- H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical. Group adjacent switches under single, multigang wall plates.
- I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings. Obtain approval of adjustments from Architect/Engineer prior to installation.

### 3.2 IDENTIFICATION

- A. Comply with Division 26 Section "Identification for Electrical Systems."
1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes. Brother P-Touch Labeling System is acceptable, in lieu of engraving.

### 3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
1. Test Instruments: Use instruments that comply with UL 1436.
  2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.
- B. Tests for Convenience Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
  2. Percent Voltage Drop under 15-A Load: A value of 3 percent or higher is not acceptable.
  3. Ground Impedance: Values of up to 2 ohms are acceptable.
  4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
  5. Using the test plug, verify that the device and its outlet box are securely mounted.
  6. The tests shall be diagnostic, indicating proper polarity, damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION 262726

## SECTION 262813

### FUSES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. Section Includes:
  - 1. Cartridge fuses rated 600-V AC and less for use in control circuits, enclosed switches, switchboards, enclosed controllers, and motor-control centers.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
  - 1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
    - a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
    - b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
  - 2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
  - 3. Current-limitation curves for fuses with current-limiting characteristics.
  - 4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
  - 5. Coordination charts and tables and related data.
  - 6. Fuse sizes for elevator feeders and elevator disconnect switches.
- B. Operation and Maintenance Data: To include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
  - 1. Ambient temperature adjustment information.
  - 2. Current-limitation curves for fuses with current-limiting characteristics.
  - 3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.

4. Coordination charts and tables and related data.

#### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fuses from a single source from a single manufacturer to the extent possible.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended application.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Comply with UL 248-11 for plug fuses.

#### 1.5 COORDINATION

- A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
  - 1. Cooper Bussmann, Inc.
  - 2. Edison Fuse, Inc.
  - 3. Ferraz Shawmut, Inc.
  - 4. Littelfuse, Inc.
  - 5. Gould
  - 6. Equal approved by Engineer.

#### 2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages, at class and current rating indicated.

#### 2.3 PLUG FUSES

- A. Characteristics: UL 248-11, nonrenewable plug fuses; 125-V ac.

#### 2.4 PLUG-FUSE ADAPTERS

- A. Characteristics: Adapters for using Type S, rejection-base plug fuses in Edison-base fuseholders or sockets; ampere ratings matching fuse ratings; irremovable once installed.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 FUSE APPLICATIONS

- A. Cartridge Fuses:
  - 1. Motor Branch Circuits: Class RK5, time delay.
  - 2. Other Branch Circuits: Class RK1, time delay.

### 3.3 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

### 3.4 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813

## SECTION 262816

### ENCLOSED SWITCHES AND CIRCUIT BREAKERS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. Section Includes:
  - 1. Fusible switches.
  - 2. Nonfusible switches.
  - 3. Molded-case circuit breakers (MCCBs).
  - 4. Enclosures.

##### 1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

##### 1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to Section 260548.
  - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

##### 1.5 SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
  2. Current and voltage ratings.
  3. Short-circuit current ratings (interrupting and withstand, as appropriate).
  4. Include evidence of NRTL listing for series rating of installed devices.
  5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
  6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
1. Wiring Diagrams: For power, signal, and control wiring.
- C. Qualification Data: For qualified testing agency.
- D. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- E. Field quality-control reports.
1. Test procedures used.
  2. Test results that comply with requirements.
  3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- F. Manufacturer's field service report.
- G. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
  2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

## 1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.



1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended application.
- E. Comply with NFPA 70.

## 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
  1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
  2. Altitude: Not exceeding 6600 feet (2010 m).
- B. Interruption of Existing Electric Service: Per Section 260500.

## 1.8 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

## PART 2 - PRODUCTS

### 2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
  1. Match existing building manufacturer.
- B. Type GD, General Duty: not allowed.
- C. Type HD, Heavy Duty, Single Throw, 240 or 600-V AC, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

- D. Type HD, Heavy Duty, Six Pole, Single Throw, 240 or 600-V AC, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- E. Type HD, Heavy Duty, Double Throw, 240 or 600-V AC, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- F. Fusible switches, 800 amps and above: NEMA bolted pressure contact switches made by firmly bolting the switchblades to the stationary contact terminals and to the hinge terminals and meet UL 977.
- G. Accessories:
  - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  - 3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  - 4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  - 5. Lugs: Mechanical type, suitable for number, size, and conductor material.
  - 6. Accessory Control Power Voltage: As required.
- H. All fusible switches: shall be rated for the application voltage specified and have a UL listed short circuit rating to match the fuse installed.

## 2.2 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
  - 1. Match existing building manufacturer.
- B. Type GD, General Duty, Single Throw, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- C. Type HD, Heavy Duty, Single Throw, 240 or 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- D. Type HD, Heavy Duty, Six Pole, Single Throw, 240 or 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

- E. Type HD, Heavy Duty, Double Throw, 240 or 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- F. Accessories:
  - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  - 3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  - 4. Lugs: Mechanical type, suitable for number, size, and conductor material.
  - 5. Accessory Control Power Voltage: Remote mounted and powered; As required.

### 2.3 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
  - 1. Match existing building manufacturer.
- B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- D. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
- E. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
- F. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).
- G. Arc-Fault Circuit-Interrupter (AFCI):
  - 1. Provide where required or called for.
  - 2. Conform to NEC 210.12 and UL 1699.
- H. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
- I. Switching Duty: All single pole circuit breakers shall be rated SWD.

## 2.4 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
  - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
  - 2. Outdoor Locations: NEMA 250, Type 3R.
  - 3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
  - 4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Anchor floor-mounting switches to concrete base.
- C. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- E. Install fuses in fusible devices.
- F. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.
- G. Most manufactures of bolted pressure switches make for line entering top and load exiting bottom. Verify shop drawings before running conduits.
- H. Do not mount switches or circuit breakers upside down or side ways.

### 3.3 IDENTIFICATION

- A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

#### 3.4 FIELD QUALITY CONTROL

##### A. Tests and Inspections:

1. Perform visual and mechanical inspections.

END OF SECTION 262816

**SECTION 265100**  
**INTERIOR LIGHTING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

A. This Section includes the following:

1. Interior lighting fixtures with LED sources.
2. Lighting fixtures mounted on exterior building surfaces with LED sources.
3. Accessories, plaster rings, fasteners, etc.

**1.2 RELATED DOCUMENTS:**

- A. The General Conditions, Supplementary Conditions, and applicable portions of Division 1 of the specification are part of this section which shall consist of all labor, equipment, materials and other costs necessary to complete all INTERIOR LIGHTING work indicated on the drawings, herein specified or both.
- B. The applicable portions of section 260000 GENERAL are hereby make a part of this section. It is important that you read that section carefully because it expands upon the requirements herein.

**1.3 SUBMITTALS**

- A. Product Data: For each type of lighting fixture scheduled, arranged in order of fixture designation. Include data on features, accessories, and finishes.
- B. Shop Drawings: Show details of nonstandard or custom fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.
- C. Operation and maintenance data.

**1.4 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.
- C. FMG Compliance: Fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FMG.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

## 2.2 LIGHTING LUMINAIRES

- A. See schedules on drawings.
- B. LED Luminaires shall meet all DesignLights Consortium® (DesignLights.org) Product Qualification Criteria. This does not require that the luminaire be listed on the DesignLights Consortium's® Qualified Products List, but they must meet the Product Qualification Criteria. The technical requirements that the luminaire shall meet for each Application Category as currently defined by the DLC Premium qualification requirements at the time of bid.
- C. Color Temperature of 3000K-4100K for interior luminaires as listed in the Luminaire Schedule on the plans. The color temperature of exterior LED luminaires should not exceed 4100K (nominal).
- D. Color Consistency: LED manufacturer shall use a maximum 2-step MacAdam Ellipse binning process to achieve consistent luminaire-to-luminaire color for interior luminaires. Exterior luminaires shall use a maximum 3-step MacAdam Ellipse binning process.
- E. Luminaire shall be mercury-free, lead-free, and RoHS compliant.
- F. Luminaire shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.
- G. Light output of the LED system shall be measured using the absolute photometry method following IES LM-79 and IES LM-80 requirements and guidelines.
- H. Luminaire shall maintain 70% lumen output (L70) for a minimum of 100,000 hours.
- I. Driver shall have a rated life of 50,000 hours, minimum.
- J. Lumen output shall not depreciate more than 5% after 10,000 hours of use.
- K. Driver and LEDs shall be furnished from a single manufacturer to ensure compatibility.
- L. Luminaire Color Rendering Index (CRI) shall be a minimum of 90 for interior luminaires, and a minimum of 80 for exterior luminaires.
- M. LED luminaire shall be thermally designed as to not exceed the maximum junction temperature of the LED for the ambient temperature of the location the luminaire is to be installed. Rated case temperature shall be suitable for operation in the ambient temperatures typically found for the intended installation. Exterior luminaires to operate in ambient temperatures of -20°F to 122°F (-29°C to 50°C).
- N. LED driver shall have a minimum power factor (pf) of 0.9 and a maximum crest factor (cf) of 1.5 at full input power and across specified voltage range.
- O. Luminaire shall operate normally for input voltage fluctuations of plus or minus 10 percent.
- P. Luminaire shall have a maximum Total Harmonic Distortion (THD) of 10% at full input power and across specified voltage range.

- Q. Wiring connections to LED drivers shall utilize polarized quick-disconnects for field maintenance.
- R. All connections to luminaires shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.
- S. Fuse Protections: All luminaires shall have built-in fuse protection. All power supply outputs shall be either fuse protected or be Polymeric Positive Temperature Coefficient (PTC)-protected as per Class 2 UL listing.
- T. The LED luminaire shall carry a limited 5-year warranty minimum for LED light engine(s)/board array, and driver(s).
- U. Provide all of the following data on submittals:
  - 1. Delivered lumens
  - 2. Input watts
  - 3. Efficacy
  - 4. Color rendering index.
- V. The failure of one LED shall not affect the operation of the remaining LEDs.
- W. Emergency Inverters shall be sine-wave type, or have written confirmation from the luminaire manufacturer that the luminaire will function with a square-wave inverter.
- X. LED driver shall be compatible with dimming controls where dimming is indicated on the plans. Dimmable drivers shall use Dimming Constant Current (DCC) or Pulse Width Modulation (PWM) operation.
- Y. LED luminaires shall dim to (20%, 15%, 10%, 5%, or 0.1%) as specified in the Luminaire Schedule on the plans without visible flicker or “popcorn effect”. “Popcorn effect” is defined as the luminaire being on a pre-set dimmed level (less than 100%), and going to 100% prior to returning to the pre-set level when power is returned to the luminaire.

### 2.3 FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 26 Section “HANGERS AND SUPPORTS” for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch (13-mm steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture).
- C. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated, 12 gage 2.68 mm.
- E. Wires For Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage (2.68 mm).



- F. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.
- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

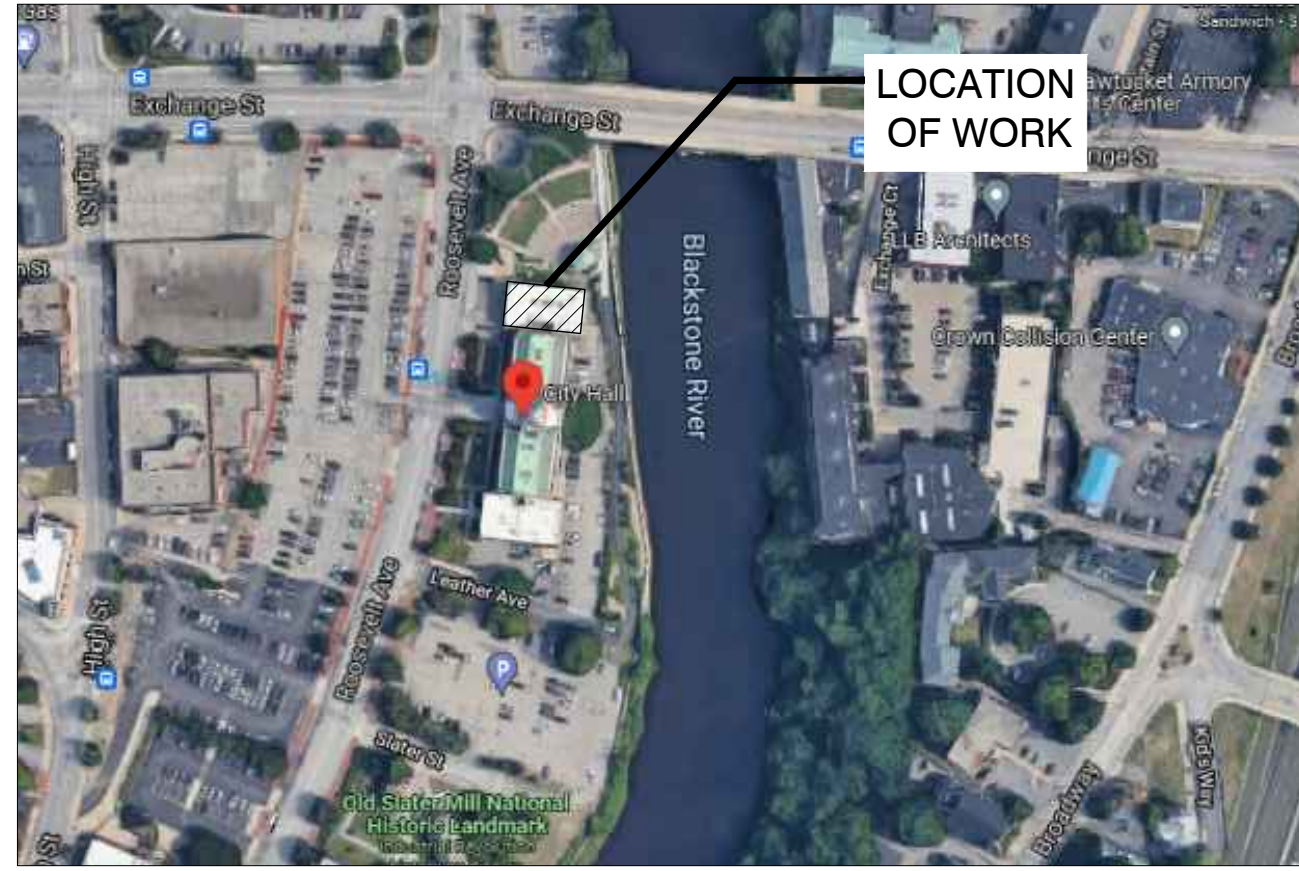
## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for support.
  - 1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches (150 mm) from fixture corners.
  - 2. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
  - 3. Provide additional support, independent of ceiling grid for all fixtures (including incandescent) by use of jack chain having breaking strength of 3 times the weight of the fixture (minimum of #12). Fixtures over one foot in length shall be supported at all four corners.
  - 4. See section 260548, "Seismic Controls" for additional requirements.
- C. Suspended Fixture Support: As follows:
  - 1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
  - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
  - 3. Continuous Rows (stem mounted): Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
  - 4. Continuous Rows (cable mounted): Suspend from cable.
  - 5. Support: Per NEC 410-16.
- D. Adjust aimable fixtures to provide required light intensities. Adjust all fixtures to the satisfaction of the Engineer. Adjustments required at night shall be done at no additional charge. Provide all equipment needed including scaffolding, if required.

END OF SECTION 265100

# LOCUS MAP



## LIST OF DRAWINGS

SHEET #	SHEET TITL	ISSUANCE DATE
G0.0	COVER SHEET	04/29/2022
G1.1	GENERAL NOTES, LEGEND, ABBREVIATIONS AND WALL TYPES	04/29/2022
G1.2	CODE EVALUATION PLAN	04/29/2022
AD1.0	DEMOLITION FLOOR PLAN & RCP	04/29/2022
A1.0	CONSTRUCTION FLOOR PLAN & RCP	04/29/2022
A3.0	RESCUE ROOM INTERIOR ELEVATIONS & ENLARGED RESTROOM PLAN	04/29/2022
A3.1	KITCHEN INTERIOR ELEVATIONS	04/29/2022
A7.0	FINISH PLAN, FURNITURE PLAN, & SCHEDULES	04/29/2022
A8.0	DETAILS	04/29/2022
M0.0	MECHANICAL LEGEND, NOTES AND ABBREVIATIONS	04/29/2022
M1.0	MECHANICAL DEMOLITION AND NEW WORK PLANS	04/29/2022
M4.0	MECHANICAL SCHEDULES	04/29/2022
M5.0	MECHANICAL DETAILS	04/29/2022
E0.0	ELECTRICAL LEGEND, NOTES & ABBREVIATIONS	04/29/2022
E1.0	ELECTRICAL LIGHTING DEMOLITION AND NEW WORK PLAN	04/29/2022
E2.0	ELECTRICAL POWER DEMOLITION AND NEW WORK PLAN	04/29/2022
E3.0	ELECTRICAL FIRE ALARM DEMOLITION AND NEW WORK PLAN	04/29/2022
E4.0	ELECTRICAL RISER DIAGRAM	04/29/2022
E5.0	ELECTRICAL SCHEDULES	04/29/2022
E8.0	ELECTRICAL DETAILS	04/29/2022
P0.0	PLUMBING LEGEND, NOTES AND ABBREVIATIONS	04/29/2022
P1.0	PLUMBING DEMOLITION AND NEW WORK PLANS	04/29/2022
P4.0	PLUMBING SCHEDULES	04/29/2022

# PAWTUCKET CITY HALL FIRE DEPARTMENT RESCUE ROOM & KITCHEN RENOVATIONS

FOR THE

# CITY OF PAWTUCKET

137 ROOSEVELT AVE, PAWTUCKET, RI 02860



APRIL 29, 2022  
ISSUED FOR BID

MECHANICAL / ELECTRICAL / PLUMBING ENGINEER  
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PAWTUCKET CITY  
HALL FIRE  
DEPARTMENT RESCUE  
ROOM & KITCHEN  
RENOVATIONS

137 ROOSEVELT AVE  
PAWTUCKET, RI 02860

Scale As Noted  
Date 04-29-2022  
Drawn by CA/MP  
Reviewed by RJ  
Job No. 21-272

Drawing Name  
**COVERSHEET**

Drawing No.

**GO.0**  
Issued for Bid

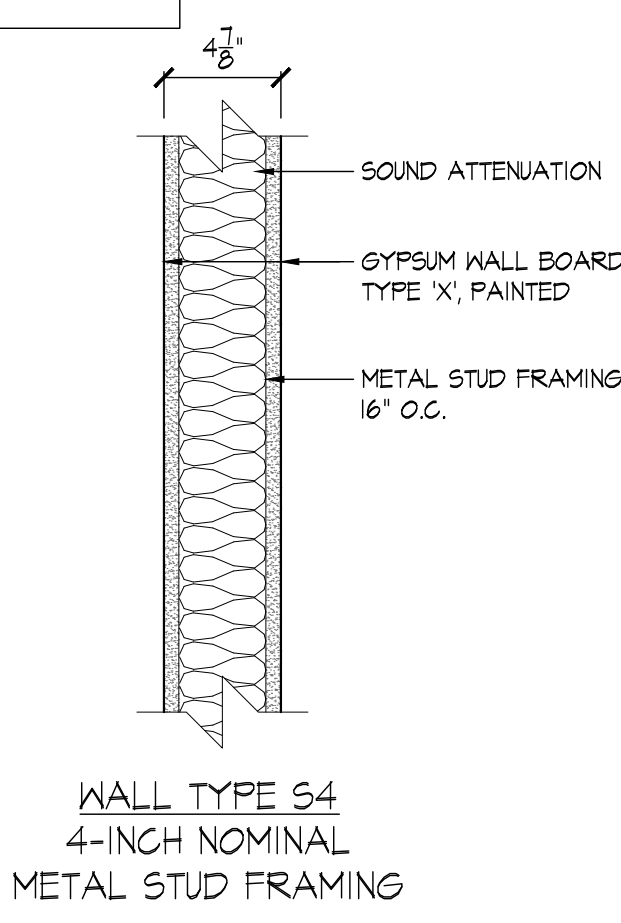
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ABBREVIATIONS			
ACC	ACCESSIBLE	NEC	NATIONAL ELECTRIC CODE
ADJ.	ADJACENT	NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOC.
A/C	AIR CONDITIONING	NFPA	NATIONAL FIRE PROTECTION ASSOC.
AFF	ABOVE FINISHED FLOOR	N.I.C.	NOT IN CONTRACT
ALT.	ALTERNATE	N.I.S.	NOT IN SCOPE
ALUM.	ALUMINUM	NO.	NUMBER
ASSOC.	ASSOCIATION	NTS	NOT TO SCALE
CJ	CONTROL JOINT	O.C.	ON CENTER
CMU	CONCRETE MASONRY UNIT	OCC.	OCCUPANTS
COORD.	COORDINATE	OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
CW	COLD WATER	PVC	POLYVINYL CHLORIDE
DIAM.	DIAMETER	FLWD RCP	PLYWOOD REFLECTED CEILING PLAN
DIM	DIMENSIONS	REQ'D	REQUIRED
DN	DOWN	RO	ROUGH OPENING
DS	DOWN SPOUT	RTU	ROOF TOP UNIT
DWGS	DRAWINGS	SCHED	SCHEDULE
ELEV	ELEVATION	SF	SQUARE FEET
EIPG	EXTERIOR INSULATION AND FINISH SYSTEM	SIM	SIMILAR
ELEC	ELECTRIC	SPECS	SPECIFICATIONS
EQ	EQUAL	SS	STAINLESS STEEL
FF	FINISHED FLOOR	STD.	STANDARD
FLR	FLOOR	STL	STEEL
GALV.	GALVANIZED	STRUCT	STRUCTURAL
G.C.	GENERAL CONTRACTOR	T&B	TOP AND BOTTOM
GLB	GYPSUM WALL BOARD	TEMP.	TEMPERATURE
HORIZ	HORIZONTAL	T.M.E.	TO MATCH EXISTING
HU	HOT WATER	T.O.	TOP OF
HVAC	HEATING, VENTILATION AND AIR CONDITIONING	T.O.J.	TOP OF JOIST
IBC	INTERNATIONAL BUILDING CODE	TYP.	TYPICAL
INT.	INTERIOR	UL	UNDERWRITERS LABORATORIES, INC.
INSUL.	INSULATION	UNO.	UNLESS NOTED OTHERWISE
LLH	LONG LEG HORIZONTAL	VERT.	VERTICAL
LLV	LONG LEG VERTICAL	V.I.F.	VERIFY IN FIELD
MAX.	MAXIMUM	VTR	VENT THROUGH ROOF
MECH.	MECHANICAL	W	WITH
MFR	MANUFACTURER	W/O	WITHOUT
MIN.	MINIMUM	WD	WOOD
N/A	NOT AFFLICABLE		

GENERAL PROJECT NOTES	
1. THE GENERAL CONTRACTOR AND ALL SUB-CONTRACTORS SHALL BE LICENSED IN THE STATE OF RHODE ISLAND AND FULLY INSURED AS REQUIRED BY APPLICABLE LAWS.	11. ALL WORK SHALL COMPLY WITH OSHA FEDERAL, STATE BUILDING, AND FIRE AND LIFE SAFETY CODES, WHICHEVER IS MOST STRINGENT.
2. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL DEMOLITION REQUIRED FOR A COMPLETE AND PROPER JOB, WHETHER OR NOT REFERENCE IS MADE BY WAY OF NOTES AND DESIGNATIONS.	12. REPAIR/RESTORE TO ORIGINAL/NEW CONDITION AT NO COST TO THE OWNER, ALL EXISTING ITEMS, MATERIALS, SURFACES, ETC. (INCLUDING AREAS NOT DESIGNATED FOR CONSTRUCTION) WHICH ARE DAMAGED DURING CONSTRUCTION. ALL RELATED COSTS SHALL BE THE SOLE RESPONSIBILITY OF THE GENERAL CONTRACTOR.
3. THE GENERAL CONTRACTOR SHALL CHECK ALL DIMENSIONS AND ACCEPT RESPONSIBILITY FOR DIMENSIONAL CORRECTNESS, GENERAL CONTRACTOR AND PROJECT MANAGER TO VERIFY ALL PROPOSED WORK AND MEASUREMENTS PRIOR TO CONSTRUCTION OR DEMOLITION.	13. ANY WORK WHICH DEVIATES FROM THAT SPECIFIED IN THE CONTRACT DOCUMENTS, CHANGED BY THE GENERAL CONTRACTOR OR SUB-CONTRACTORS, INVOLVING THE SUBSTITUTION OF MATERIALS/EQUIPMENT SHALL BE THE SOLE RESPONSIBILITY OF THE GENERAL CONTRACTOR.
4. THE DRAWINGS ARE NOT TO BE SCALED. ALL WORK LINES AND LEVELS SHALL BE LAID OUT BY WRITTEN DIMENSIONS. ALL DIMENSIONS ARE SHOWN FROM FACE OF CONCRETE/MASONRY/STUD TO FACE OF CONCRETE/MASONRY/STUD. ANY DEVIATIONS SHALL BE CORRECTED BY THE CONTRACTOR BEFORE BEGINNING THAT PORTION OF THE WORK.	14. DELAYS CAUSED BY IMPROPER PLANNING WILL NOT BE TOLERATED, NOR ACCEPTABLE. GENERAL CONTRACTOR SHALL ASSUME SOLE RESPONSIBILITY FOR UNNECESSARY DELAYS IN THE CONTRACT.
5. THE GENERAL CONTRACTOR SHALL NOT SEPARATE CONSTRUCTION DOCUMENTS FOR DISTRIBUTION TO SUBCONTRACTORS. ALL CONTRACTORS SHALL BE RESPONSIBLE FOR COORDINATING AND "CROSS-REFERENCING" DRAWINGS.	15. THE GENERAL CONTRACTOR SHALL NOT PROCEED WITH ANY ADDITIONAL WORK ABOVE AND BEYOND THAT SPECIFIED IN THESE CONTRACT DOCUMENTS WITHOUT THE WRITTEN AUTHORIZATION OF THE OWNER AND ARCHITECT. THE GENERAL CONTRACTOR SHALL OTHERWISE DO SO AT HIS OWN EXPENSE.
6. THE GENERAL CONTRACTOR SHALL ENSURE ADEQUATE DUST-CONTROL MEASURES, SUCH AS, BUT NOT LIMITED TO POLYETHYLENE SHEETING/ TAPING, TEMPORARY PARTITIONING, ETC. ARE PRACTICED FOR THE DURATION OF THE PROJECT. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CLEANING MEASURES, TO RESTORE SUCH AREAS TO ORIGINAL/ NEW CONDITION (INCLUDING DRAINAGE SYSTEMS, ROOF, ETC.).	16. IN CASE OF CONFLICT OR CONFUSION WHERE THE GENERAL CONTRACTOR DID NOT REQUEST CLARIFICATION PRIOR TO SUBMITTING HIS BID, THE GENERAL CONTRACTOR SHALL INTERPRET THE CONTRACT DOCUMENTS TO REQUIRE THE GREATER QUANTITY, HIGHER QUALITY, MOST RESTRICTIVE, AND MOST EXPENSIVE OF THE POSSIBLE INTERPRETATIONS.
7. THE FIRE STATION IS TO REMAIN OPERATIONAL AT ALL TIMES, 24-HOURS PER DAY AND 7-DAYS A WEEK. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF THE PUBLIC, PERSONNEL, ALL MATERIALS AND EQUIPMENT/FURTHERANCES, AND MAINTAINING SAFE CONDITIONS WITHIN THE PROPOSED CONSTRUCTION AREA AT ALL TIMES. THE CONTRACTOR SHALL DESIGN AND INSTALL ADEQUATE SHORING AND BRACING FOR ALL STRUCTURAL OR REMOVAL TASKS. THE GENERAL CONTRACTOR SHALL ASSUME SOLE RESPONSIBILITY FOR ANY DAMAGES & INJURIES RESULTING FROM AND DURING THE EXECUTION OF THE WORK. ALL PARTITIONS ARE TO BE CONSTRUCTED AS REQUIRED BY LOCAL, STATE AND FEDERAL LAWS, CODES AND STANDARDS.	17. STRUCTURAL MEMBERS SHALL NOT BE MODIFIED IN THE FIELD WITHOUT WRITTEN APPROVAL FROM THE ARCHITECT. IN THE EVENT OF A CONSTRUCTION OR FABRICATION ERROR, THE GENERAL CONTRACTOR SHALL PREPARE A SKETCH WITH A PROPOSED REPAIR AND SUBMIT IT TO THE ARCHITECT FOR APPROVAL PRIOR TO PERFORMING ANY CORRECTIVE WORK.
8. THE GENERAL CONTRACTOR SHALL COORDINATE ALL WORK WITH THE OWNER, SUB-CONTRACTORS AND APPLICABLE DISCIPLINES SUCH AS, BUT NOT LIMITED TO STRUCTURAL, MECHANICAL, PLUMBING, ELECTRICAL AND FIRE PROTECTION CONTRACTORS.	18. DELAYS CAUSED BY IMPROPER PLANNING WILL NOT BE TOLERATED, NOR ACCEPTABLE. CONTRACTOR SHALL ASSUME SOLE RESPONSIBILITY FOR UNNECESSARY DELAYS IN THE CONTRACT.
9. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE DAILY REMOVAL AND DISPOSAL OF ALL DEBRIS FROM SITE.	19. THE GENERAL CONTRACTOR SHALL PROVIDE SUCH STORAGE SHEDS, TEMPORARY BUILDINGS, OR TRAILERS AS REQUIRED FOR THE PERFORMANCE OF THE CONTRACT. ALL LOCATIONS SHALL BE REVIEWED WITH THE OWNER AND ARCHITECT PRIOR TO COMMENCEMENT OF WORK.
10. GENERAL CONTRACTOR AND ALL SUB CONTRACTORS SHALL VISIT THE SITE AND CAREFULLY EXAMINE THE AREAS IN QUESTION AS TO CONDITIONS WHICH MAY ADVERSELY AFFECT PROPER EXECUTION OF THE WORK. PRIOR TO SUBMITTING BIDS AND PRIOR TO CONSTRUCTION, ALL DIMENSIONS AND QUANTITIES SHALL BE DETERMINED OR VERIFIED BY THE GENERAL CONTRACTOR. NO CLAIMS FOR EXTRA COSTS WILL BE ALLOWED BECAUSE OF LACK OF FULL KNOWLEDGE OF THE EXISTING CONDITIONS OR SCOPE OF WORK FOR THE PROJECT.	20. MATERIALS SHALL BE HANDLED, STORED, INSTALLED, CLEANED, AND PROTECTED IN ACCORDANCE WITH THE BEST PRACTICE IN THE INDUSTRY AND IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS AND DIRECTIONS.
	21. TEMPORARY FACILITIES AND UTILITIES TO BE REVIEWED WITH OWNER AND ARCHITECT PRIOR TO COMMENCEMENT OF WORK.

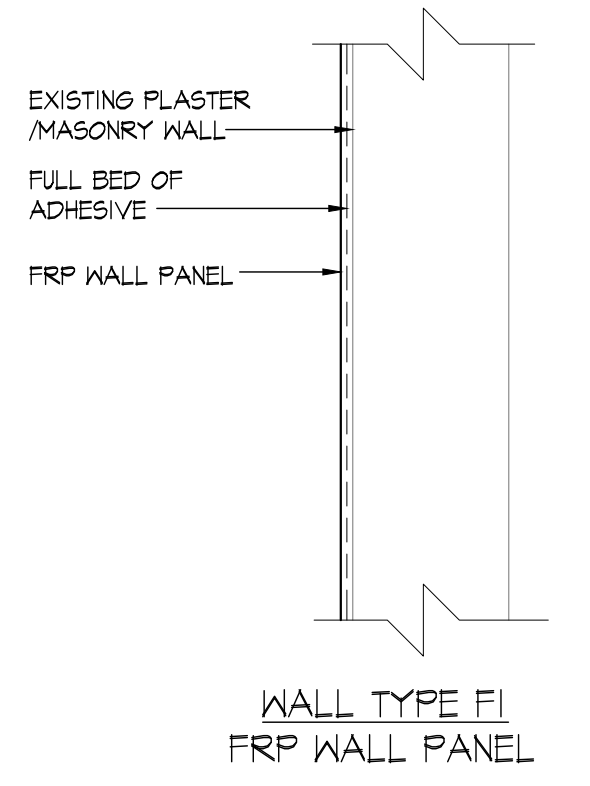
GENERAL INTERIOR NOTES	
1. GENERAL CONTRACTOR IS TO PREPARE ALL SUBSTRATE SURFACES PER MANUFACTURER'S REQUIREMENTS TO RECEIVE FINISHES, TYPICAL.	11. CLEAN SAND & REMOVE DUST ON ALL SURFACES TO BE PAINTED PRIOR TO APPLYING PAINT. ALL SURFACES TO BE PAINTED SHALL BE HAND-WASHED WITH A NON-SAPONIFYING SOLUTION SUCH AS "TSP" UNTIL ALL TRACES OF DIRT, OIL, OR GREASE HAVE BEEN REMOVED. PROVIDE STAIN BLOCK "EQUAL TO 'KILZ'" AT ALL CEILING AND WALL STAINS PRIOR TO PAINTING.
2. PROVIDE MOISTURE-RESISTANT GYPSUM BOARD AT ALL WALLS OF TOILET/ BATHROOMS AND ALL "WET" AREAS AND WHERE INDICATED ON THE DRAWINGS.	12. LIGHT FIXTURE COVERS SHALL BE REMOVED AND WASHED PRIOR TO PAINTING AND REINSTALLED AFTER PAINTING IS COMPLETED.
3. PROVIDE NEW CONTINUOUS SEALANT, AT TOP AND BOTTOM JOINT OF ALL PARTITIONS WHERE TOP AND BOTTOM OF GYPSUM BOARD MEETS THE FLOOR AND CONCRETE CEILING ABOVE.	13. DEVICE OUTLETS, RECEPTACLES AND SWITCH COVER PLATES SHALL BE REMOVED AND WASHED PRIOR TO PAINTING AND REINSTALLED AFTER PAINTING IS COMPLETED.
4. PROVIDE LEVEL-4 FINISH - STANDARD TAPED JOINTS BELOW FINISH CEILING HEIGHT.	14. DOOR HARDWARE SHALL BE REMOVED PRIOR TO PAINTING AND REINSTALLED AFTER PAINTING IS COMPLETED.
5. ALL PENETRATIONS THROUGH FIRE-RATED PARTITIONS SHALL BE FIRE-CAULKED WITH AN INTUMESCENT FIRESTOP AND SEALED.	15. GENERAL CONTRACTOR SHALL SUBMIT MANUFACTURER'S STANDARD COLOR CHARTS FOR ALL SPECIFIED MATERIALS. (COLOR SCHEDULE TO BE COMPLETED UPON RECEIPT AND APPROVAL OF ALL SPECIFIED FINISHES) ALL COLOR SAMPLES SHALL BE SUBMITTED TO THE OWNER AND ARCHITECT SIMULTANEOUSLY. COLOR SELECTIONS WILL NOT BE MADE UNTIL ALL COLOR SAMPLES HAVE BEEN RECEIVED.
6. UNLESS OTHERWISE NOTED ALL GYPSUM WALL BOARD WORK INCLUDING BOARD, TRACK, INSULATION, FASTENERS, ACCESSORIES, AND OTHER MATERIALS SHALL BE NEW AND FREE OF ALL DAMAGE AND IMPERFECTIONS.	16. ALL SPECIFIED FINISHES SHALL BE CONTINUOUS BEHIND ALL MOUNTED OR APPLIED ITEMS, IE: TOILETS, WALL CABINETS AND ACCESSORIES.
7. PROVIDE ALL PAINT, PRIMERS AND ACCESSORIES, ETC. BY MANUFACTURER, IN ACCORDANCE WITH THEIR PRINTED SPECIFICATIONS. PAINT REQUIREMENTS SHALL BE (2) COAT PRIMER AND (2) FINISH COATS.	17. GENERAL CONTRACTOR SHALL ASSURE THAT NO ELECTRIC RECEPTACLE OR TELECOMMUNICATIONS OUTLET COVERPLATES HAVE BEEN INSTALLED PRIOR TO COMPLETION OF APPLICATION OF ANY WALL FINISH MATERIALS. ANY SUCH COVERPLATES OR SURFACE HARDWARE, ETC., IN PLACE, SHALL BE REMOVED PRIOR TO WALL FINISH APPLICATION.
8. PROVIDE NEW TRANSITION STRIP AT ALL DISSIMILAR FLOOR TYPES, UNLESS OTHERWISE NOTED.	18. UPON COMPLETION OF THE WORK AND PRIOR TO THE FINAL CLEANING, GENERAL CONTRACTOR SHALL REMOVE ALL PAINT, ETC. FROM WHERE IT HAS SPILLED, SPLASHED, OR SPLATTERED.
9. PROVIDE CEMENT BOARD AT ALL WALLS OF TOILET/BATHROOMS AND ALL "WET" AREAS DESIGNATED FOR CERAMIC TILE INSTALLATION. SEAL FLASH ALL JOINTS, TYPICAL. INSTALL IN STRICT ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND INDUSTRY STANDARDS.	19. GENERAL CONTRACTOR RESPONSIBLE FOR FIELD VERIFICATION OF ALL DIMENSIONS, QUANTITIES, ETC. OF THEIR RESPECTIVE WORK.
10. PROVIDE NEW P.T. AND FIRE-RESISTANT WOOD BLOCKING WITHIN ALL PARTITIONS FOR MOUNTING OF ALL WALL MOUNTED SHELVING, CABINETS, ETC., TYPICAL.	20. ALL FLOOR FINISH CHANGES AT DOORWAYS SHALL OCCUR UNDER CENTERLINE OF DOOR UNLESS NOTED OTHERWISE.
	21. ALL FINISH FLOORING MATERIAL INSTALLATION SHALL BE PER MANUFACTURER'S RECOMMENDATION AND SPECIFICATIONS. SEAMS SHALL BE MADE TIGHT/INVISIBLE. GENERAL CONTRACTOR SHALL PROVIDE AND MAINTAIN ADEQUATE PROTECTION FOR ALL NEWLY INSTALLED FLOORING MATERIALS FOR THE DURATION OF CONSTRUCTION AND REMOVE PROTECTION ONLY IMMEDIATELY BEFORE JOB COMPLETION. FLOOR SHALL BE THOROUGHLY CLEANED OF ALL ADHESIVE, GROUT, CONSTRUCTION STAINS, ETC.
	22. GENERAL CONTRACTOR IS TO PREPARE ALL SUBSTRATE SURFACES PER MFG'S REQUIREMENTS TO RECEIVE FINISHES.
	23. WALL THICKNESS DOES NOT INCLUDE PLASTER/COMPOUND OR WALL FINISHES THICKNESS.

SYMBOL LEGEND			
	DEMOLITION NOTE TAG		ROOM TAG
	NEW CONSTRUCTION FLOOR PLAN NOTE TAG		ELEVATION CALLOUT
	NEW CONSTRUCTION ELEVATION NOTE TAG		ENLARGED PLAN DETAIL
	DOOR TAG		SECTION CALLOUT
	FINISH TAG		
	WALL TYPE IDENTIFICATION TAG		
	WINDOW TAG		

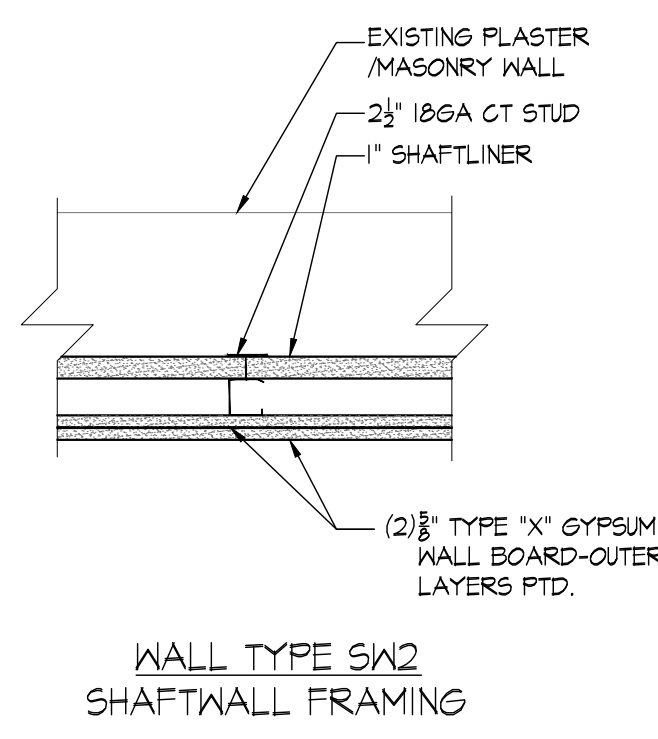


- WALL TYPE S4.1**
- 3/8" TYPE 'X' G.W.B. INSTALLED VERTICALLY OR HORIZONTALLY (BOTH SIDES)
  - 3/8" METAL CONTINUOUS SLOTTED DEFLECTION TRACK
  - 3/8" METAL STUD FRAMING @ 16" O.C.
  - CONTINUOUS SOUND ATTENUATION INSULATION
  - 3/8" CONTINUOUS METAL TRACK

- WALL TYPE S4.2**
- 3/8" TYPE 'X' G.W.B. INSTALLED VERTICALLY OR HORIZONTALLY (ONE SIDE ONLY)
  - 3/8" TYPE 'X' M.R.G.W.B. INSTALLED VERTICALLY OR HORIZONTALLY (BEGINNING AT 4'-0") (SYMBOL SIDE ONLY)
  - 1/2" CEMENT BACKER BOARD (UP TO 4'-0") (SYMBOL SIDE ONLY)
  - CERAMIC TILE (UP TO 4'-0") (SYMBOL SIDE ONLY)
  - 3/8" METAL CONTINUOUS SLOTTED DEFLECTION TRACK
  - CONTINUOUS SOUND ATTENUATION INSULATION
  - 3/8" METAL STUD FRAMING @ 16" O.C.
  - 3/8" CONTINUOUS METAL TRACK

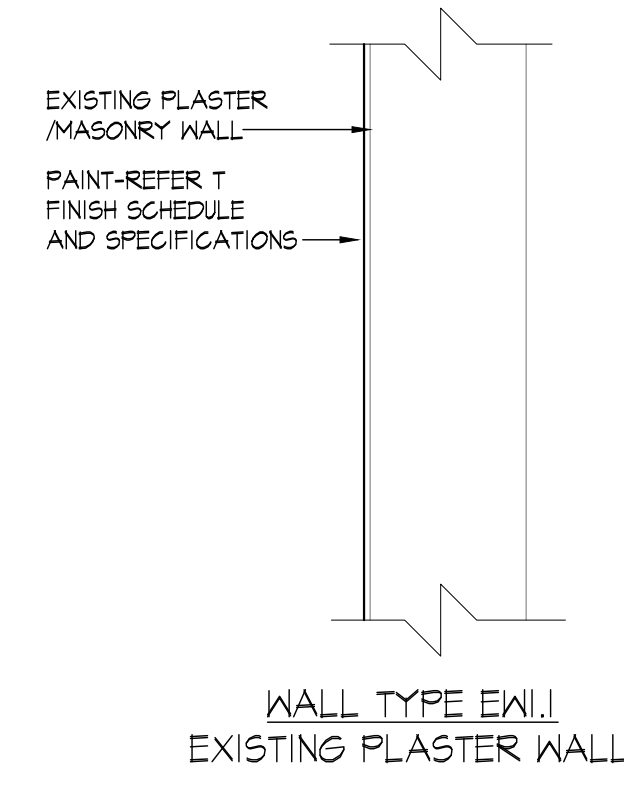


- WALL TYPE FI**
- FRP WALL PANEL FULLY ADHERED TO EXISTING WALL SUBSTRATE BOARD INSTALLED VERTICALLY (KITCHEN SIDE ONLY-UP TO 8'-0")
  - RETURN FRP WALL PANELS AT AT WINDOW JAMB LOCATIONS-TERMINATE AT WINDOW JAMB
  - CONTINUOUS FRP WALL PANEL PREFABRICATED H-CHANNELS
  - CONTINUOUS INSIDE AND OUTSIDE CORNER PREFABRICATED FRP L-SHAPED OR C-SHAPED CHANNELS
  - CONTINUOUS FRP PREFABRICATED L-SHAPED TOP CHANNEL-APPLY CONTINUOUS BEAD OF SEALANT



- WALL TYPE SK2.1**
- 2x4 18ga CT STUD AT 24" O.C.
  - 1" CONTINUOUS SHAFTLINER
  - (2) LAYERS OF 3/8" TYPE 'X' G.W.B. INSTALLED HORIZONTALLY/ VERTICALLY, STAGGER LAYERS- OUTER LAYER OF G.W.B. PAINTED
  - CONTINUOUS J-TABBED TRACK (HEADER & BASE OF WALL)
  - CONTINUOUS 1/2" INTUMESCENT SEALANT JOINT (HEADER)
  - CONTINUOUS CONTROL JOINTS-PTD - FULL HEIGHT (30'-0" MAX)

- WALL TYPE SK2.2**
- SIMILAR TO SK2.1 EXCEPT
- 2x4 18ga CT STUD AT 24" O.C.
  - 1" CONTINUOUS SHAFTLINER
  - (1) LAYERS OF 3/8" TYPE 'X' G.W.B. INSTALLED HORIZONTALLY/ VERTICALLY, (INNER LAYER)
  - 3/8" TYPE 'X' M.R.G.W.B. INSTALLED VERTICALLY OR HORIZONTALLY (PAINTED BEGINNING AT 4'-0")-FLUID APPLIED WATERPROOFING MEMBRANE (UP TO 4'-0")
  - CERAMIC TILE (UP TO 4'-0") (SYMBOL SIDE ONLY)- WITH CONTINUOUS METAL CHANNEL (TOP)
  - CONTINUOUS J-TABBED TRACK (HEADER & BASE OF WALL)
  - CONTINUOUS 1/2" INTUMESCENT SEALANT JOINT (HEADER & BASE OF WALL)
  - CONTINUOUS CONTROL JOINTS-PTD - FULL HEIGHT (30'-0" MAX HORIZONTALLY)



- WALL TYPE EW1**
- EXISTING PLASTER WALL - REPAIR/PATCH AS REQUIRED TO RECEIVE NEW PAINT

1 G10 INTERIOR WALL PARTITION TYPES  
SCALE: 3/4" = 1'-0"

**STARCK ARCHITECTS**

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Providence, RI 02903

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**PAWTUCKET CITY HALL FIRE DEPARTMENT RESCUE ROOM & KITCHEN RENOVATIONS**

137 ROOSEVELT AVE  
PAWTUCKET, RI 02860

Scale	As Noted
Date	04-29-2022
Drawn by	CA/MP
Reviewed by	RJ
Job No.	21-272

Drawing Name  
**GENERAL NOTES, LEGEND, ABBREVIATIONS, AND WALL TYPES**

Drawing No.  
**G1.1**  
Issued for Bid

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PAWTUCKET CITY  
HALL FIRE  
DEPARTMENT RESCUE  
ROOM & KITCHEN  
RENOVATIONS

137 ROOSEVELT AVE  
PAWTUCKET, RI 02860

Scale As Noted  
Date 04-29-2022  
Drawn by CA/MP  
Reviewed by RJ  
Job No. 21-272

Drawing Name  
**CODE EVALUATION PLAN**

Drawing No.

**G1.2**

Issued for Bid

### CODE SUMMARY

PROJECT DATA	
PROJECT NAME:	PAWTUCKET CITY HALL - FIRE DEPARTMENT RESCUE ROOM & KITCHEN INTERIOR RENOVATIONS
PROJECT ADDRESS:	137 ROOSEVELT AVE, RHODE ISLAND 02860
MBLU:	43/0485/1
LOT No:	
PROJECT DESCRIPTION:	THE PROJECT CONSISTS OF INTERIOR RENOVATION AT THE FORMER EMERGENCY DISPATCH ROOM AND THE KITCHEN AT PAWTUCKET FIRE STATION NO.2

GOVERNING AGENCIES		
ZONING DEPARTMENT & PLANNING DEPARTMENT	FIRE MARSHAL	BUILDING DEPARTMENT
PAWTUCKET ZONING DEPARTMENT	STATE OF RHODE ISLAND OFFICE OF THE STATE FIRE MARSHAL PLAN REVIEW UNIT	PAWTUCKET ZONING DEPARTMENT
ADDRESS: 137 ROOSEVELT AVE FIRST FLOOR PAWTUCKET, RI 02860 PHONE No. (401) 728-0500 ext.291	ADDRESS: 560 JEFFERSON BLVD. SUITE 100 WARWICK, RI 02886 PHONE No. (401) 889-5555	ADDRESS: 137 ROOSEVELT AVE FIRST FLOOR PAWTUCKET, RI 02860 PHONE No. (401) 728-0500 ext.291

### APPLICABLE CODES: RHODE ISLAND STATE BUILDING CODES

STATE BUILDING CODE	TITLE	EDITION	APPLICABLE
RISBC-01-2021	BUILDING CODE	IBC - 2018 plus RI Amendments	X
RISBC-03-2021	PLUMBING CODE	IPC - 2018 plus RI Amendments	X
RISBC-04-2021	MECHANICAL CODE	IMC - 2018 plus RI Amendments	X
RISBC-05-2021	ELECTRIC CODE	NEC - 2020 plus RI Amendments	X
RISBC-06-2021	PROPERTY MAINTENANCE CODE	IPMC - 2018 plus RI Amendments	
RISBC-08-2021	ENERGY CONSERVATION CODE	IECC - 2018 plus RI Amendments	
RISBC-10-2021	BUILDING CODE INTERPRETATIONS		
RISBC-12-2021	NEW MATERIALS, DEVICES, OR METHODS OF CONSTRUCTION		
RISBC-19-2021	FUEL GAS CODE REGULATION	IFGC - 2018 plus RI Amendments	
RIESC	ELEVATOR SAFETY CODE	ASME A17.1-2016 plus RI Amendments	

STATE FIRE SAFETY CODE			
RIFSC	FIRE SAFETY CODE	NFPA 01 - 2018 plus RI Amendments	X
	INSTALLATION OF SPRINKLER SYSTEMS	NFPA 13 - 2019 plus RI Amendments	
	ELECTRICAL CODE	NFPA 70	X
	FIRE ALARM CODE	NFPA 72 - 2019 plus RI Amendments	X
RILSC	LIFE SAFETY CODE	NFPA 101 - 2018 plus RI Amendments	X
	STANDARD OF TYPES OF BUILDING CONSTRUCTION	NFPA 220 - 2015	X

ACCESSIBILITY REGULATIONS			
RISBC-01-2021		IBC - 2018 CHAPTER 11: ICC/ANSI A117.1 - 2009 plus RI Amendments AMERICANS w/ DISABILITIES ACT (ADA - 2010)	X

OCCUPANCY CLASSIFICATION & USE & SPECIAL REQUIREMENTS (IBC CHAPTER 3 & 4)				
OCCUPANCY SUMMARY: EXISTING CONSTRUCTION-TYPE IIB				
OCCUPANCY:	IBC CLASSIFICATION	IBC REFERENCE	NFPA CLASSIFICATION	NFPA REFERENCE
	MODERATE HAZARD STORAGE S-1	SECTION 311.2	MULTIPLE OCCUPANCIES	A 6.1.14
	RESIDENTIAL R3	SECTION 310.4		

### GENERAL BUILDING HEIGHTS & AREAS (IBC CHAPTER 5)

AREA & HEIGHT CALCULATIONS			
ABLE 504.3, 504.4 & 506.2:			
MODERATE HAZARD STORAGE S-1			
OCCUPANCY CLASSIFICATION	SPRINKLERED (S) / NON SPRINKLERED (NS)	ALLOWABLE	PROPOSED PER SECTION 503.1
MAX HEIGHT	NS	55'	N/A
MAX STORIES	NS	3 STORIES	N/A
ALLOWABLE AREA FACTOR	-	26,000	N/A

SECTION 507.3 THE AREA OF A GROUP S-1 BUILDING NO MORE THAN ONE STORY IN HEIGHT SHALL NOT BE LIMITED WHERE THE BUILDING IS SURROUNDED AND ADJOINED BY PUBLIC WAYS OR YARDS NOT LESS THAN 60 FEET IN WIDTH.

OCCUPANCY CLASSIFICATION			
RESIDENTIAL R-3	SPRINKLERED (S) / NON SPRINKLERED (NS)	ALLOWABLE	PROPOSED
MAX HEIGHT	NS	60'	N/A
MAX STORIES	NS	4 STORIES	N/A
ALLOWABLE AREA FACTOR	-	UL	N/A
BUILDING LEVEL GSF:			
LOW HAZARD FACTORY INDUSTRIAL-F2	FIRST FLOOR	4,190 GSF	
	SECOND FLOOR	3,706 GSF	
	THIRD FLOOR	4,190 GSF	

RESIDENTIAL R-3	FIRST FLOOR	N/A
	SECOND FLOOR	484 GSF
TOTAL BUILDING AREA 12,570 GSF		

SECTION 508 MIXED USE AND OCCUPANCY		
MODERATE HAZARD STORAGE S-1	IBC TABLE 508.4	NFPA 101 TABLE 6.1.14.4.1(B)
RESIDENTIAL R-3	2 HR	2 HR

### TYPES OF CONSTRUCTION (IBC CHAPTER 6)

BUILDING ELEMENT			
	RATING IN HOURS		NFPA 220 (TABLE 4.1.1)
	IBC (TABLE 601)		
	CONSTRUCTION TYPE IIB		RATING TYPE II (000)
STRUCTURAL FRAME	0 HR		0 HR
BEARING WALLS: EXTERIOR	0 HR		0 HR
INTERIOR	0 HR		0 HR
NON BEARING WALLS & PARTITIONS: (EXTERIOR)	0 HR		0 HR
NON BEARING WALLS & PARTITIONS: (INTERIOR)	0 HR		0 HR
FLOOR CONSTRUCTION: ( & SECONDARY MEMBERS SEC. 202)	0 HR		0 HR
ROOF CONSTRUCTION: ( & SECONDARY MEMBERS SEC. 202)	0 HR		0 HR

### FIRE AND SMOKE PROTECTION FEATURES (IBC CHAPTER 7)

FLOOR AND ROOF ASSEMBLIES-SECTION 711	
SUPPORTING CONSTRUCTION 711.2.3	EXCEPTION 2: HORIZONTAL ASSEMBLIES AT THE SEPARATIONS OF DWELLING UNITS AND SLEEPING UNITS AS REQUIRED BY SECTION 420.3
GROUPS I-1, R-1, R-2, R-3 AND R-4 420.3	EXCEPTION 2: IN GROUP R-3 AND R-4 FACILITIES, FLOOR ASSEMBLIES WITHIN THE DWELLING UNITS OR SLEEPING UNITS ARE NOT REQUIRED TO BE CONSTRUCTED AS HORIZONTAL ASSEMBLIES.

### CODE SUMMARY-CONTINUED

INTERIOR FINISHES (IBC CHAPTER 8)			
(IBC TABLE 803.13) & (NFPA 101 A.10.2.2)			
OCCUPANCY CLASSIFICATION: NON SPRINKLERED			
MODERATE HAZARD STORAGE S-1	INTERIOR EXIT, STAIRWAYS, RAMPS & EXIT PASSAGEWAYS	CORRIDORS & ENCLOSURE FOR EXIT ACCESS STAIRWAYS & RAMPS	ROOMS & ENCLOSED SPACES
IBC	B	B	C
NFPA 101	A OR B	A,B OR C	A,B OR C

OCCUPANCY CLASSIFICATION: SPRINKLERED			
RESIDENTIAL R-3	INTERIOR EXIT, STAIRWAYS, RAMPS & EXIT PASSAGEWAYS	CORRIDORS & ENCLOSURE FOR EXIT ACCESS STAIRWAYS & RAMPS	ROOMS & ENCLOSED SPACES
IBC	C	C	C
NFPA 101	A, B OR C	A,B OR C	A,B OR C

FIRE PROTECTION REQUIREMENTS (IBC CHAPTER 9)	
PORTABLE FIRE EXTINGUISHERS:	SECTION 906.1
PROVIDE SURFACE MOUNTED/SEMI RECESSED FIRE EXTINGUISHERS AND CABINETS AS REQUIRED AND IN ACCORDANCE WITH INTERNATIONAL FIRE CODE FIRE CODE AND NFPA CODES & STANDARDS. COORDINATE EXTINGUISHER TYPES, QUANTITIES, AND LOCATIONS w/ THE PAWTUCKET FIRE DEPARTMENT.	

OCCUPANCY LOADS (IBC CHAPTER 10)			
MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT			
TOTAL OCCUPANT LOAD BASED ON OVERLAP OF TWO MAXIMUM SHIFT SIZES PER INFORMATION PROVIDED BY THE OWNER			
OCCUPANCY CLASSIFICATION: OCCUPANT LOAD FACTOR			
IBC TABLE 1004.5	NFPA 101 TABLE 7.3.1.2	PROPOSED	

MODERATE HAZARD STORAGE S-1 (KITCHEN)	300 GROSS	500 GROSS	3706 SQFT
RESIDENTIAL R-3	200 GROSS	200 GROSS	484 SQFT
OCCUPANCY CLASSIFICATION: LEVEL			
MODERATE HAZARD STORAGE S-1 (KITCHEN)	SECOND FLOOR	3706	12 OCC.
RESIDENTIAL R-3	SECOND FLOOR	484	3 OCC.

SECOND FLOOR TOTAL: 4,190 15 OCC.			
EGRESS REQUIREMENTS (IBC CHAPTER 10)			
MEANS OF EGRESS			
OCCUPANCY CLASSIFICATION: NON SPRINKLERED			
MODERATE HAZARD STORAGE S-1	ALLOWABLE	EXCEPTION	PROPOSED
COMMON PATH:			
IBC TABLE 1006.2.1	100 LF		72 LF
NFPA 101 TABLE A.7.6	50 LF		72 LF
LENGTH OF TRAVEL:			
IBC TABLE 1017.2	300 LF		72 LF
NFPA 101 TABLE 7.6	200 LF		72 LF
DEAD END CORRIDOR:			
IBC SECTION 1020.4	20 LF		20 LF MOST STRINGENT
NFPA 101 TABLE 7.6	50 LF	50 LF	50 LF

RESIDENTIAL R-3: NON SPRINKLERED			
COMMON PATH:			
IBC TABLE 1006.2.1	NP	SHALL ONLY APPLY IN A GROUP R-3 LOCATED IN A MIXED OCCUPANCY BUILDING	30'-7" LF
NFPA 101 TABLE A.7.6	NR		30'-7" LF
LENGTH OF TRAVEL:			
IBC TABLE 1017.2	200 LF		76'-8" LF
NFPA 101 TABLE 7.6	NR		76'-8" LF
DEAD END CORRIDOR:			
IBC SECTION 1020.4	20 LF		20 LF MOST STRINGENT
NFPA 101 TABLE 7.6	NR		NR

EXIT REMOTENESS			
OCCUPANCY CLASSIFICATION: NON SPRINKLERED			
IBC-1007.1.1	NFPA 101 7.5.1.3.2	PROPOSED	
MODERATE HAZARD STORAGE S-1			
1/2 OVERALL DIAGONAL		1/2 OVERALL DIAGONAL	SEE FLOOR PLAN
OCCUPANCY CLASSIFICATION: NON SPRINKLERED			
IBC-1007.1.1	NFPA 101 7.5.1.3.2	PROPOSED	
RESIDENTIAL R-3			
1/2 OVERALL DIAGONAL		1/2 OVERALL DIAGONAL	SEE FLOOR PLAN

MINIMUM EGRESS WIDTH REQUIREMENT-MODERATE HAZARD STORAGE S-1-NON-SPRINKLERED							
EGRESS COMPONENT	IBC SECTION	NFPA 101 SECTION	OCCUPANT LOAD SERVED	MINIMUM WIDTH	CALCULATED WIDTH	MINIMUM WIDTH REQUIRED	PROPOSED
STAIR	IBC 1011.2	7.2.2.2.1.2(B)	12 OCCUPANTS	44"	12 OCC. x 0.3"	44"	44"
DOOR	IBC 1010.1.1	7.2.1.2.1	12 OCCUPANTS	32"	12 OCC. x 0.2"	24"	32"
CORRIDOR	IBC 1020.2	7.3.4.1	12 OCCUPANTS	36"	12 OCC. x 0.2"	24"	N/A
MINIMUM EGRESS WIDTH REQUIREMENT-RESIDENTIAL R-3-NON-SPRINKLERED							
EGRESS COMPONENT	IBC SECTION	NFPA 101 SECTION	OCCUPANT LOAD SERVED	MINIMUM WIDTH	CALCULATED WIDTH	MINIMUM WIDTH REQUIRED	PROPOSED
STAIR	IBC 1011.2	7.2.2.2.1.2(B)	3 OCCUPANTS	36"	3 OCC. x 0.3"	36"	N/A
DOOR	IBC 1010.1.1	7.2.1.2.1	3 OCCUPANTS	32"	3 OCC. x 0.2"	32"	32"
CORRIDOR	IBC 1020.2	7.3.4.1	3 OCCUPANTS	36"	3 OCC. x 0.2"	36"	44"

TOTAL EXITS REQUIREMENT - IBC TABLE 1006.3.2 & NFPA 101 7.4.1.2			
OCCUPANT LOAD (PERSON PER STORY)	MINIMUM EXITS REQUIRED IBC TABLE 1006.3.2	MINIMUM EXITS REQUIRED NFPA 101 SEC. 7.4.1.2	PROPOSED
KITCHEN - 12 OCC.	2	2	2
DWELLING UNITS- 3 OCC.	2	2	2

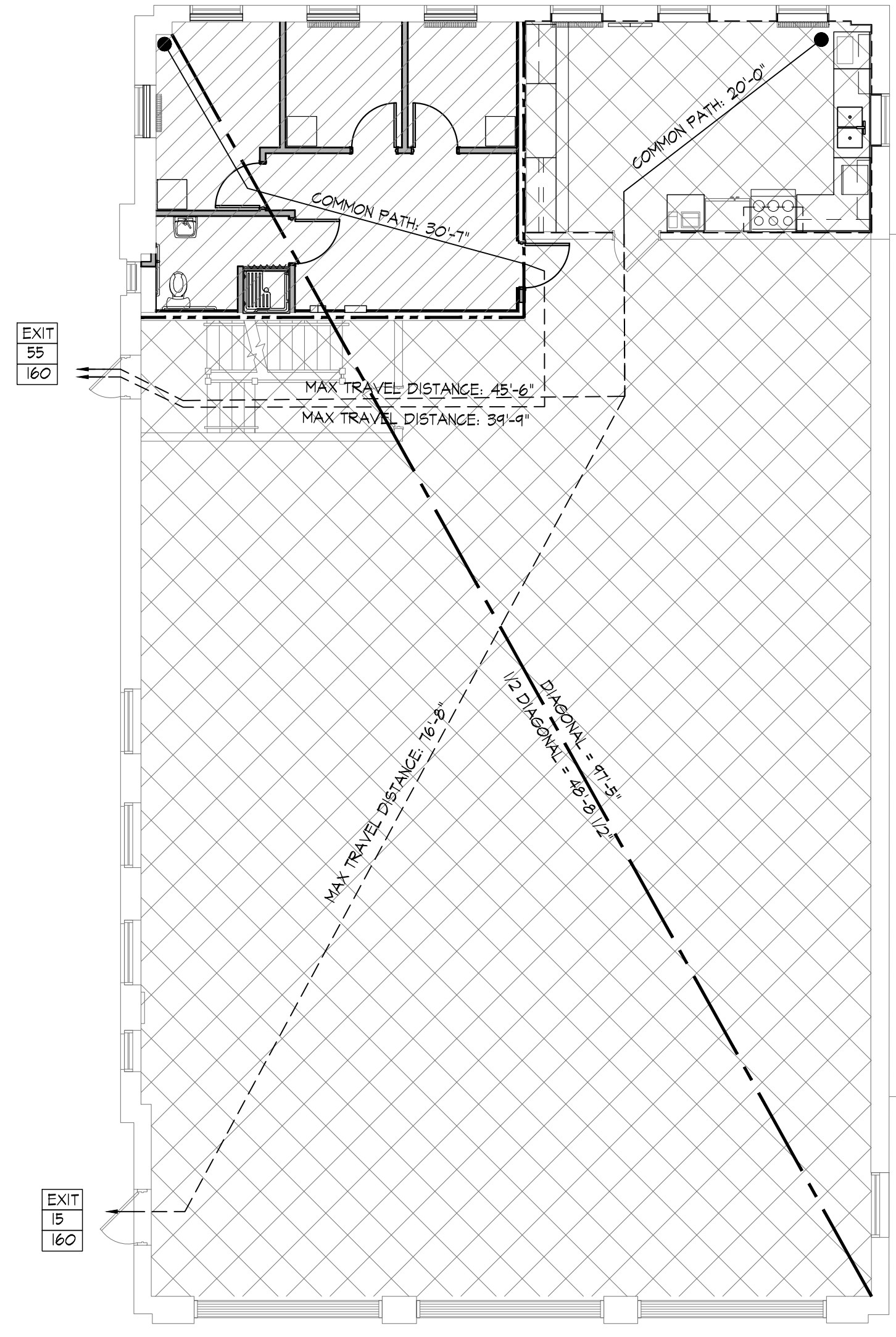
### CODE SUMMARY-CONTINUED

PLUMBING FIXTURE REQUIREMENTS (IBC CHAPTER 29 & IPC CHAPTER 4)							
PLUMBING SUMMARY - IBC TABLE 2902.1							
OCCUPANCY CLASSIFICATION: MODERATE HAZARD STORAGE -S-1							
TOTAL OCCUPANT LOAD: 40 OCC.							
No. MALE OCCUPANTS: 40 OCC.							
No. FEMALE OCCUPANTS:							
**PER IPC SECTION 403.1.1, EXCEPTION: THE TOTAL OCCUPANT LOAD SHALL NOT BE REQUIRED TO BE DIVIDED IN HALF WHERE APPROVED STATISTICAL DATA INDICATES A DISTRIBUTION OF THE SEXES OF OTHER THAN 50 PERCENT OF EACH SEX.							

FLOOR	FITTURE	REQUIRED				PROPOSED			
		PER OCC.	MALE	FEMALE	TOTAL	MALE	FEMALE	UNISEX	TOTAL
OVERALL	WATER CLOSETS	1 PER 100	--	--	1	7	--	--	7
	URINALS	N/A				2	N/A	--	2
	LAVATORIES	1 PER 100	--	--	1	6	--	--	70
	BATHUBS/ SHOWERS	N/A	N/A	N/A	N/A	6	--	--	6
	DRINKING FOUNTAINS	1 PER 400	N/A	N/A	1	N/A	N/A	N/A	1
	MOP SINK	1	N/A	N/A	1	N/A	N/A	N/A	1

OCCUPANCY CLASSIFICATION: RESIDENTIAL R-3							
TOTAL OCCUPANT LOAD: 3 OCC.							
No. MALE OCCUPANTS:							
No. FEMALE OCCUPANTS: 3 OCC.							

FLOOR	FITTURE	REQUIRED				PROPOSED			
		PER OCC.	MALE	FEMALE	TOTAL	MALE	FEMALE	UNISEX	TOTAL
OVERALL	WATER CLOSETS	1 PER 10	--	1	1	--	1	--	1
	URINALS	N/A				--	N/A	--	--
	LAVATORIES	1 PER 10	--	1	1	--	1	--	1
	BATHUBS/ SHOWERS	1 PER 8	--	1	1	--	1	--	1
	DRINKING FOUNTAINS	1 PER 100	N/A	N/A	N/A	N/A	N/A	N/A	1
	MOP SINK	1	N/A	N/A	1	N/A	N/A	N/A	EXISTING



FIRE STATION NO.2  
CODE EVALUATION PLAN - SECOND FLOOR  
SCALE: 1/8" = 1'-0"

**CODE EVALUATION LEGEND**

- TRAVEL DISTANCE
- COMMON PATH
- EXIT
- XX ACTUAL OCCUPANT LOAD (PASSING THROUGH DOOR/STAIR)
- XX ALLOWABLE OCCUPANT LOAD (PASSING THROUGH DOOR/STAIR)
- 1-HOUR RATED FIRE SEPARATION
- 2-HOUR RATED FIRE SEPARATION
- (R-3) RESIDENTIAL (OCCUPANCY GROUP)
- (S-1) MODERATE-HAZARD STORAGE (OCCUPANCY GROUP)

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Scale As Noted  
Date 04-29-2022  
Drawn by CA/MP  
Reviewed by RJ  
Job No. 21-272

Drawing Name  
**DEMOLITION FLOOR  
PLAN & RCP**

Drawing No.

**AD1.0**

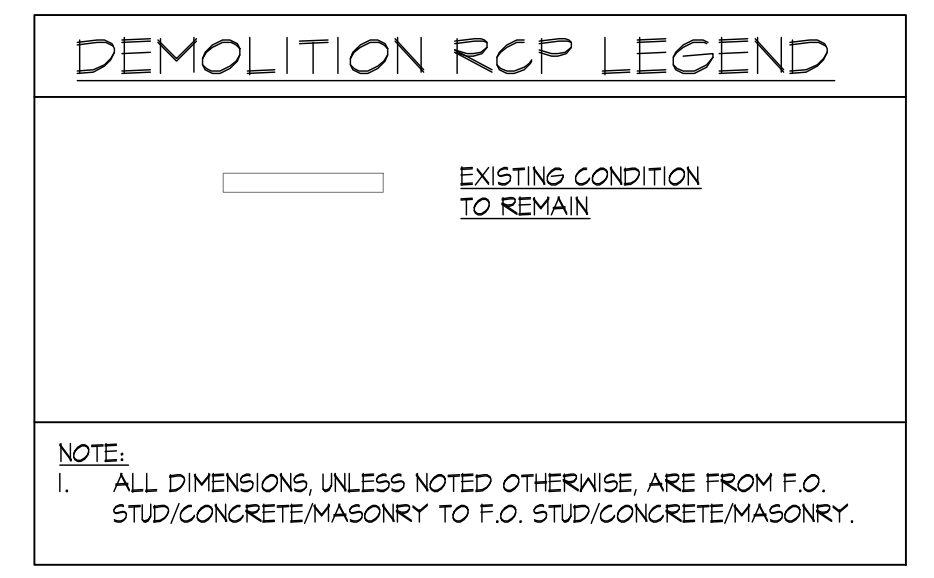
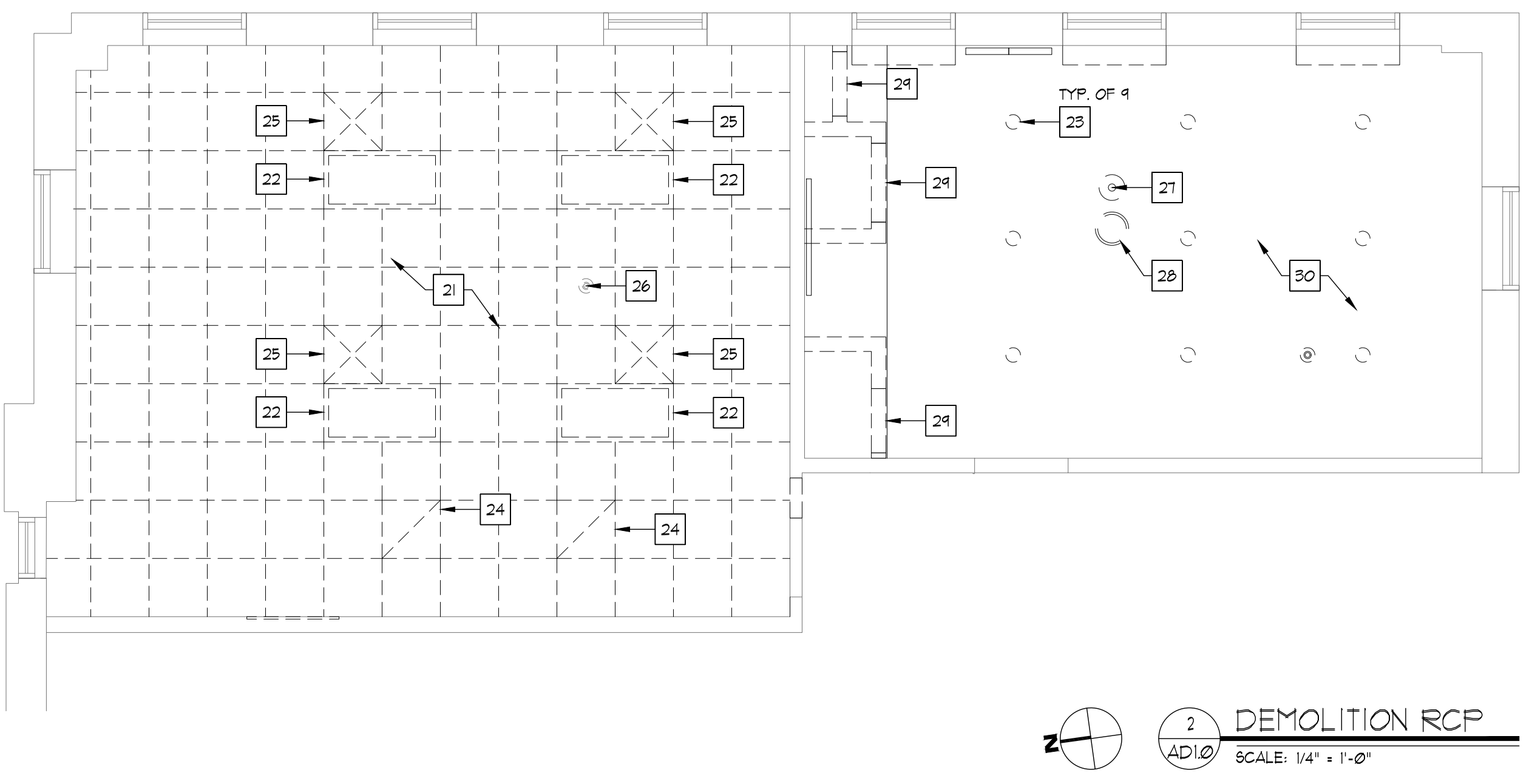
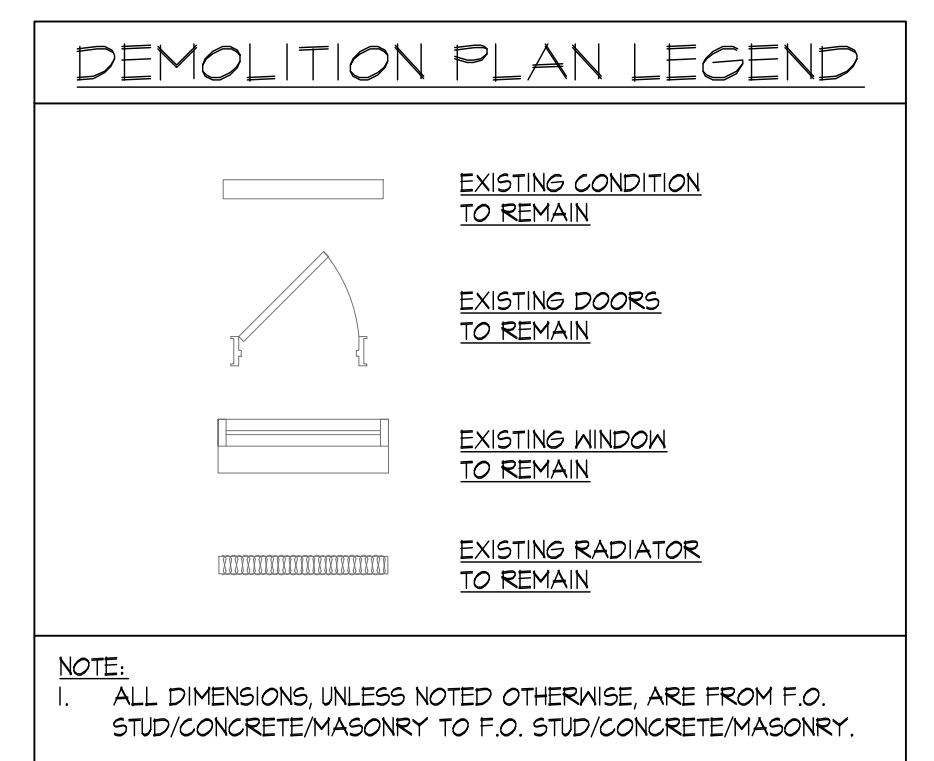
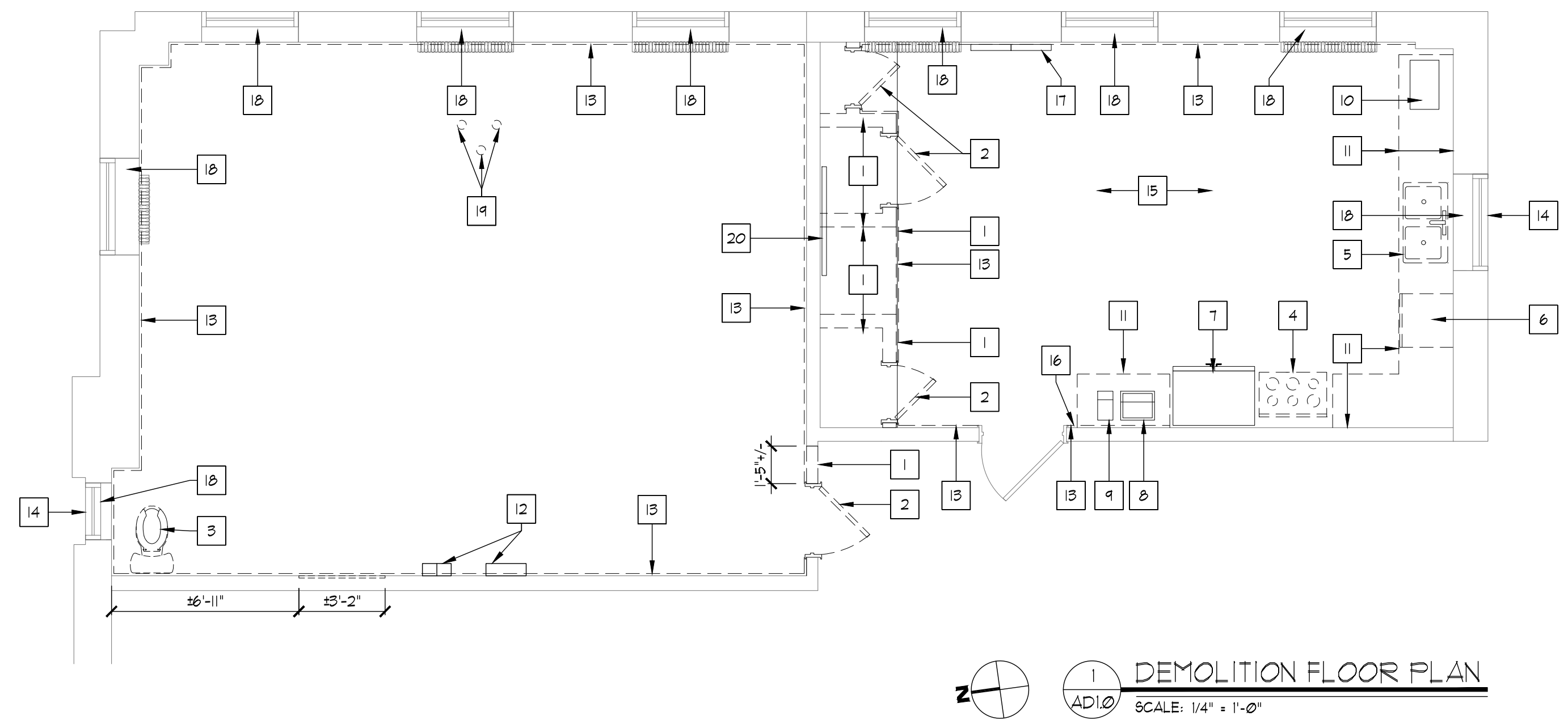
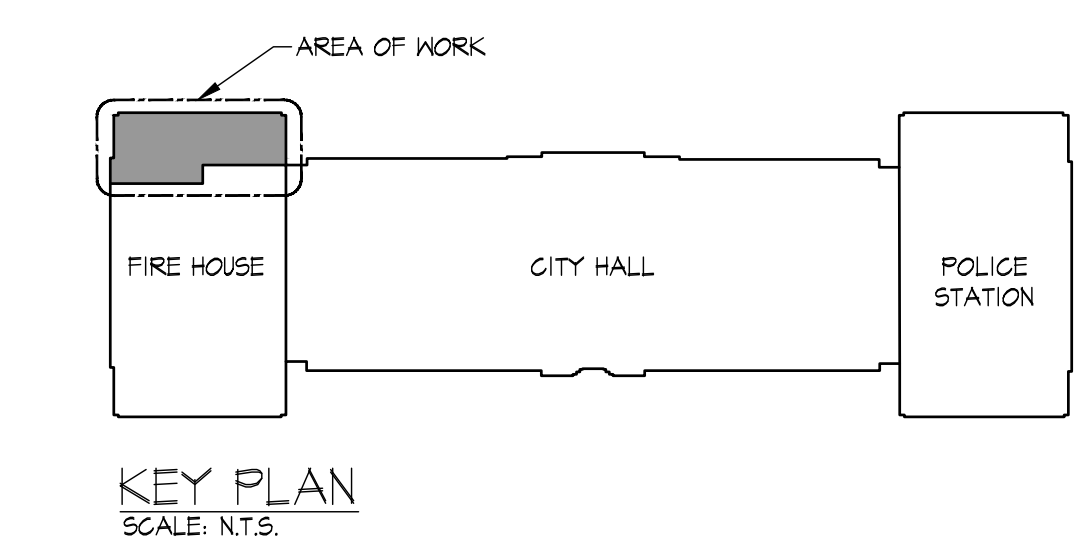
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- ### GENERAL DEMOLITION NOTES
- GENERAL CONTRACTOR TO CLEAN & PREPARE WALLS, FLOORS & CEILING AS REQUIRED FOR DEMOLITION AND NEW WORK.
  - GENERAL CONTRACTOR TO REMOVE AND PATCH ALL ANCHORS, FASTENERS AND SUPPORTS ASSOCIATED WITH EXISTING EQUIPMENT, MATERIALS, FINISHES, FIXTURES AND UTILITIES THAT ARE TO BE REMOVED.
  - GENERAL CONTRACTOR TO PROTECT ALL EXISTING SURFACES INCLUDING BUT NOT LIMITED TO FLOORS, WALLS, DOORS AND WINDOWS.
  - GENERAL CONTRACTOR IS RESPONSIBLE FOR THE REMOVAL AND DISPOSAL OF ALL DEMOLITION MATERIALS, UNLESS OTHERWISE NOTED OR REQUESTED BY OWNER.
  - GENERAL CONTRACTOR TO REMOVE, PROTECT AND SAFELY STORE ALL NON-ATTACHED ITEMS. COORDINATE AND VERIFY STORAGE AREAS WITH OWNER PRIOR TO COMMENCEMENT OF THE WORK.
  - GENERAL CONTRACTOR TO REMOVE ALL FINISHES AS REQUIRED FOR NEW WORK INCLUDING, BUT NOT LIMITED TO: ADHESIVES, GROUT, THRESHOLDS, TRANSITION STRIPS AND GULIE. GENERAL CONTRACTOR TO PREPARE EXISTING SURFACES AS REQUIRED TO RECEIVE NEW FINISHES AS SPECIFIED.
  - ALL ABANDONED ELECTRICAL TO BE COMPLETELY REMOVED BACK TO THE ELECTRICAL PANEL BY A LICENSED ELECTRICIAN IN ACCORDANCE TO ALL APPLICABLE CODES AND REGULATIONS.
  - ALL ABANDONED COMMUNICATIONS AND DATA WIRING TO BE REVIEWED WITH OWNER PRIOR TO REMOVAL BY THE GENERAL CONTRACTOR IN ACCORDANCE TO ALL APPLICABLE CODES AND REGULATIONS. GENERAL CONTRACTOR TO PROVIDE A LIST OF ALL PORT NUMBERS OF THE TELE/DATA LOCATIONS THAT WERE REMOVED TO OWNER.
  - GENERAL CONTRACTOR TO PROVIDE ALL LABOR, MATERIALS & EQUIPMENT NECESSARY TO PERFORM ALL WORK SHOWN ON PLANS AND SPECIFICATIONS.
  - GENERAL CONTRACTOR TO PROVIDE AND MAINTAIN TEMPORARY VISUAL AND PROTECTIVE PARTITIONS AROUND CONSTRUCTION AS MAY BE NECESSARY TO ASSURE THE SAFETY OF ALL PERSONS AUTHORIZED OR UNAUTHORIZED.
  - STRUCTURAL MEMBERS SHALL NOT BE MODIFIED IN THE FIELD WITHOUT WRITTEN APPROVAL FROM THE ARCHITECT. IN THE EVENT OF A CONSTRUCTION OR FABRICATION ERROR, THE CONTRACTOR SHALL PREPARE A SKETCH WITH A PROPOSED REPAIR, AND SUBMIT IT TO THE ARCHITECT FOR APPROVAL PRIOR TO PERFORMING ANY CORRECTIVE WORK.
  - GENERAL CONTRACTOR TO PROVIDE ALL REQUIRED PENETRATIONS FOR ALL TRADES INCLUDING STRUCTURAL, PLUMBING, MECHANICAL, ELECTRICAL, IT, FIRE PROTECTION AND GEOTHERMAL.
  - GENERAL CONTRACTOR TO PATCH ALL EXISTING DISTURBED WALL, FLOOR AND CEILING FINISHES AS SPECIFIED.
  - GENERAL CONTRACTOR TO INFILL ALL SAWCUTS, ABANDONED FLOOR PENETRATIONS AND/OR MODIFIED CONCRETE SLAB TO MATCH EXISTING.
  - COORDINATE ALL REMOVALS WITH GENERAL, MECHANICAL, ELECTRICAL, PLUMBING CONTRACTORS.
  - REFER TO ALL OTHER PLANS FOR ADDITIONAL NOTES, ABBREVIATIONS AND SYMBOLS.
  - AN ATTEMPT HAS BEEN MADE TO INDICATE ITEMS FOR REMOVAL. NOT ALL ITEMS REQUIRING REMOVAL MAY NOT BE SHOWN. GENERAL CONTRACTOR IS RESPONSIBLE TO REMOVE ALL ITEMS AS REQUIRED FOR NEW CONSTRUCTION. ALL WORK SHALL BE COORDINATED BY THE GENERAL CONTRACTOR. REMOVE ALL UNUSED AND/OR ABANDONED EQUIPMENT AND COMPONENTS UNLESS NOTED OTHERWISE.
  - MAINTAIN AND PROTECT FROM DAMAGE EXISTING TO REMAIN UTILITIES AND SYSTEMS AND COMPONENTS.
  - REVIEW CONDITIONS OF EXISTING WALLS AND FLOORS TO REMAIN. PATCH ANY DAMAGE OR HOLES ETC. TO MATCH EXISTING ADJ. SURFACES AND RESURFACE AS REQUIRED PRIOR TO PAINTING/REFINISHING.
  - GENERAL CONTRACTOR TO COORDINATE SAFE STORAGE OF SALVAGED ITEMS WITH OWNER.
  - ENTIRE SCOPE OF DEMOLITION IS NOT LIMITED TO THIS DRAWING-REFER TO ENTIRE SET OF DRAWINGS AND THE PROJECT MANUAL FOR ADDITIONAL INFORMATION. PROVIDE ALL DEMOLITION NECESSARY FOR A COMPLETE AND PROPER JOB.

- ### DEMOLITION FLOOR PLAN KEY NOTES
- REMOVE & PROPERLY DISPOSE OF EXISTING INTERIOR WALL PARTITION IN ITS ENTIRETY AS REQUIRED FOR A COMPLETE AND PROPER JOB. REFER TO NEW CONSTRUCTION FLOOR PLAN FOR ADDITIONAL INFORMATION.
  - REMOVE & PROPERLY DISPOSE OF EXISTING DOOR, FRAME AND HARDWARE IN ITS ENTIRETY. REFER TO CONSTRUCTION FLOOR PLAN FOR ADDITIONAL INFORMATION.
  - REMOVE & PROPERLY DISPOSE OF EXISTING WATER CLOSET AND ACCESSORY COMPONENTS. TEMPORARILY CUT AND CAP COLD WATER AND TEMPORARILY CUT AND PLUG WASTE LINE. PREPARE EXISTING FLOOR SLAB TO RECEIVE NEW FLOOR FINISH AS SPECIFIED. REFER TO PLUMBING DRAWINGS FOR ADDITIONAL INFORMATION. EXISTING PLUMBING FOR FUTURE USE.
  - REMOVE & PROPERLY DISPOSE OF EXISTING KITCHEN RANGE AND ASSOCIATED GAS PIPING. REMOVE GAS PIPING BACK TO SHUT OFF VALVE AND CAP OFF PIPING. WHERE APPLICABLE, PATCH AND REPAIR WALLS AS REQUIRED DUE TO DEMOLITION AND PREPARE WALL TO RECEIVE NEW WALL FINISH AS SPECIFIED. REFER TO PLUMBING DRAWINGS FOR ADDITIONAL INFORMATION.
  - REMOVE & PROPERLY DISPOSE OF EXISTING SINK AND ASSOCIATED PIPING AND MATERIALS. TEMPORARILY CUT AND CAP COLD WATER AND TEMPORARILY CUT AND CAP WASTE LINE. WHERE APPLICABLE, PATCH AND REPAIR WALLS AS REQUIRED DUE TO DEMOLITION AND PREPARE WALL TO RECEIVE NEW WALL FINISH AS SPECIFIED. REFER TO PLUMBING DRAWINGS FOR ADDITIONAL INFORMATION.
  - REMOVE & PROPERLY DISPOSE OF EXISTING DISHWASHER AND ASSOCIATED PIPING AND MATERIALS. TEMPORARILY CUT AND CAP COLD WATER AND TEMPORARILY CUT AND CAP WASTE LINE. WHERE APPLICABLE, PATCH AND REPAIR WALLS AS REQUIRED DUE TO DEMOLITION AND PREPARE WALL TO RECEIVE NEW WALL FINISH AS SPECIFIED. REFER TO PLUMBING DRAWINGS FOR ADDITIONAL INFORMATION.
  - EXISTING REFRIGERATOR TO REMAIN AND SALVAGE FOR OWNER. TEMPORARILY REMOVE, STORE AND RE-INSTALL AFTER COMPLETION OF CONSTRUCTION. CONTRACTOR TO COORDINATE WITH OWNER FOR TEMPORARY STORAGE.
  - EXISTING ICE MACHINE TO REMAIN AND SALVAGE FOR OWNER. TEMPORARILY REMOVE, SAFELY STORE AND RE-INSTALL AFTER COMPLETION OF CONSTRUCTION. CONTRACTOR TO COORDINATE WITH OWNER FOR TEMPORARY STORAGE.
  - EXISTING COFFEE MACHINE TO REMAIN AND SALVAGE FOR OWNER. TEMPORARILY REMOVE, SAFELY STORE AND RE-INSTALL AFTER COMPLETION OF CONSTRUCTION. CONTRACTOR TO COORDINATE WITH OWNER FOR TEMPORARY STORAGE.
  - EXISTING MICROWAVE TO REMAIN AND SALVAGE FOR OWNER. TEMPORARILY REMOVE, SAFELY STORE AND RE-INSTALL AFTER COMPLETION OF CONSTRUCTION. CONTRACTOR TO COORDINATE WITH OWNER FOR TEMPORARY STORAGE.
  - REMOVE & PROPERLY DISPOSE OF EXISTING KITCHEN CABINETS (UPPER AND LOWER), COUNTERTOP AND TILE WALL BACKSPLASHES AND ASSOCIATED MATERIALS IN ITS ENTIRETY. WHERE APPLICABLE, PATCH AND REPAIR WALLS AS REQUIRED DUE TO DEMOLITION AND PREPARE WALL TO RECEIVE NEW WALL FINISH AS REQUIRED.
  - EXISTING TO REMAIN FIRE ALARM CONTROL PANEL. TO REMAIN OPERATIONAL FOR THE DURATION OF THE PROJECT. CONTRACTOR TO TAKE ALL MEANS NECESSARY TO PROTECT THE EXISTING TO REMAIN FIRE ALARM SYSTEM OPERATIONAL FOR THE DURATION OF THE PROJECT.
  - REMOVE & PROPERLY DISPOSE OF EXISTING WAINSCOTING, INCLUDING CHAIR RAIL. WHERE APPLICABLE, GYPSUM WALL BOARD AND FURRING STRIPS IN ITS ENTIRETY AS REQUIRED FOR A COMPLETE AND PROPER JOB. WHERE APPLICABLE, PATCH AND REPAIR WALLS AS REQUIRED TO DEMOLITION AND PREPARE WALL TO RECEIVE NEW WALL FINISH AS SPECIFIED. REFER TO CONSTRUCTION FLOOR PLAN FOR ADDITIONAL INFORMATION.
  - REMOVE AND PROPERLY DISPOSE OF UPPER WINDOW GLAZING AND ASSOCIATED MATERIALS, INCLUDING BUT NOT LIMITED TO, SEALANTS, GLAZING HARDWARE, CLEAN AND PREP WINDOW FRAME FOR INSTALLATION OF NEW IMPACT RESISTANT INFILL PANEL.
  - EXISTING TO REMAIN QUARRY TILE FLOOR. CONTRACTOR TO TEMPORARILY PROTECT THE EXISTING TO REMAIN QUARRY TILE FLOOR FOR THE DURATION OF PROJECT. DAMAGED QUARRY TILE TO BE REPLACED "IN-LIKE" KIND AT NO ADDITIONAL EXPENSE TO THE OWNER.
  - EXISTING TO REMAIN SPEAKER/RADIO SYSTEM TO REMAIN OPERATIONAL. CONTRACTOR TO TEMPORARILY PROTECT FOR THE DURATION OF THE PROJECT.
  - EXISTING 2-DOOR ENCLOSED BULLETIN BOARD TO BE REMOVED AND SALVAGED FOR THE OWNER. CONTRACTOR TO COORDINATE TEMPORARY STORAGE WITH OWNER. RE-INSTALL AFTER THE PROJECT COMPLETION.
  - EXISTING WOOD WINDOW SILL AND ACCESSORY MATERIALS TO BE REMOVED IN ITS ENTIRETY. AN PROPERLY DISPOSED OF. PREPARE SUBSTRATE TO ENSURE A COMPLETE AND PROPER JOB. PREPARE WINDOW SILLS TO RECEIVE NEW PVC SILL.
  - INFILL EXISTING CONCRETE SLAB OPENINGS, TYPICAL. PREPARE CONCRETE SLAB TO RECEIVE NEW FLOORING. REFER TO FINISH SCHEDULE FOR ADDITIONAL INFORMATION.
  - EXISTING T.V. MONITOR TO REMAIN AND SALVAGE FOR OWNER. TEMPORARILY REMOVE, STORE AND RE-INSTALL AFTER COMPLETION OF CONSTRUCTION. CONTRACTOR TO COORDINATE WITH OWNER FOR TEMPORARY STORAGE.

- ### DEMOLITION RCP KEY NOTES
- REMOVE & PROPERLY DISPOSE OF EXISTING 2X2 CEILING GRID SYSTEM AND CEILING TILES AND ASSOCIATED MATERIALS IN ITS ENTIRETY. REFER TO REFLECTED CEILING PLAN FOR ADDITIONAL INFORMATION.
  - REMOVE & PROPERLY DISPOSE OF EXISTING 2X4 LIGHT FIXTURES AND ASSOCIATED MATERIALS IN ITS ENTIRETY. REFER TO ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
  - REMOVE & PROPERLY DISPOSE OF EXISTING RECESSED CAN LIGHT FIXTURES AND ASSOCIATED MATERIALS IN ITS ENTIRETY. REFER TO ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
  - REMOVE & PROPERLY DISPOSE OF EXISTING AIR RETURN GRILLE. REFER TO MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION.
  - REMOVE & PROPERLY DISPOSE OF EXISTING AIR SUPPLY GRILLE. REFER TO MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION.
  - REMOVE & DISPOSE OF EXISTING SMOKE DETECTOR. REFER TO ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
  - REMOVE & DISPOSE OF EXISTING OCCUPANCY SENSOR. REFER TO ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
  - REMOVE & DISPOSE OF EXISTING LOUD SPEAKER AND ASSOCIATED MATERIALS AND SALVAGE FOR OWNER. REFER TO ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
  - REMOVE & PROPERLY DISPOSE OF EXISTING DOOR HEADER AND ASSOCIATED MATERIALS IN ITS ENTIRETY.
  - REMOVE & PROPERLY DISPOSE EXISTING GYPSUM BOARD CEILING AND ASSOCIATED MATERIALS IN ITS ENTIRETY. WHERE APPLICABLE, PATCH AND REPAIR WALLS AS AN CEILINGS REQUIRED FOR DEMOLITION AND PREPARE WALLS/CEILINGS TO RECEIVE NEW FINISHES AS SPECIFIED. REFER TO EXISTING/NEW FLOOR PLAN FOR ADDITIONAL INFORMATION.





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Scale **As Noted**  
Date **04-29-2022**  
Drawn by **CA/MP**  
Reviewed by **RJ**  
Job No. **21-272**

Drawing Name  
**CONSTRUCTION FLOOR  
PLAN & RCP**

Drawing No.

**A1.0**

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**TYPICAL CONSTRUCTION NOTES**

- ALL EXISTING-TO-REMAIN WALL, FLOOR AND CEILING FINISHES ARE TO BE CLEANED TO "LIKE-NEW" CONDITION WITHIN THE LIMIT OF WORK AREA - ALL AREAS DAMAGED DURING CONSTRUCTION ARE TO BE REPLACED / REFINISHED TO MATCH EXISTING OR NEW APPROVED FINISH.
- CONTRACTOR SHALL PATCH AND/OR REPAIR ALL EXISTING WALL ASSEMBLIES, CEILINGS AND FLOOR FINISHES SCHEDULED TO REMAIN, DAMAGED AND/OR NEWLY EXPOSED AS THE RESULT OF CONSTRUCTION ACTIVITIES. MATCH AND BLEND FINISHES WITH ADJACENT SURFACES AS REQUIRED.
- CONTRACTOR SHALL PATCH AND/OR REPAIR ALL EXISTING WALL ASSEMBLIES, FINISHES, CEILINGS AND FLOOR MATERIALS RESULTING WITH ABANDONED PENETRATIONS OR REMOVAL OF EXISTING FIXTURES. BLEND FINISHES WITH ADJACENT SURFACES AS REQUIRED.
- PRIOR TO INSTALLING NEW FLOORING, CONTRACTOR SHALL ENSURE THAT EXISTING FLOOR SUBSTRATE IS LEVELLED AND PREPARED AS REQUIRED TO RECEIVE NEW FLOORING PER MANUFACTURER'S RECOMMENDATIONS.

**CONSTRUCTION PLAN LEGEND**

	EXISTING CONDITION TO REMAIN
	EXISTING DOORS RE. DOOR SCHEDULE
	EXISTING WINDOW TO REMAIN
	EXISTING RADIATOR TO REMAIN

**NOTE:**  
1. ALL DIMENSIONS, UNLESS NOTED OTHERWISE, ARE FROM F.O. STUD/CONCRETE/MASONRY TO F.O. STUD/CONCRETE/MASONRY.

**CONSTRUCTION PLAN KEY NOTES**

- RE-INSTALL EXISTING SALVAGED REFRIGERATOR.
- RE-INSTALL EXISTING SALVAGED ICE MACHINE. REFER TO PLUMBING AND ELECTRICAL ELEVATIONS FOR ADDITIONAL INFORMATION.
- RE-INSTALL EXISTING SALVAGED COFFEE MACHINE.
- RE-INSTALL EXISTING SALVAGED MICROWAVE.
- RE-INSTALL EXISTING SALVAGED 2-DOOR ENCLOSED BULLETIN BOARD. REFER TO INTERIOR ELEVATIONS FOR ADDITIONAL INFORMATION.
- FURNISH AND INSTALL NEW ELECTRICAL COMMERCIAL GRADE RANGE. REFER TO EQUIPMENT SCHEDULE AND ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
- FURNISH AND INSTALL NEW STAINLESS STEEL WORKTABLE WITH INTEGRAL WELDED STAINLESS STEEL SINK. REFER TO EQUIPMENT SCHEDULE AND PLUMBING DRAWINGS FOR ADDITIONAL INFORMATION.
- FURNISH AND INSTALL NEW DISHWASHER. FABRICATE NEW STAINLESS STEEL METAL PANELS. INSTALL BENEATH STAINLESS STEEL COUNTERTOPS AND ON EACH SIDE OF DISHWASHER. SECURE TO UNDERSIDE OF METAL COUNTERTOPS AND EXISTING QUARRY TILE FLOOR. REFER TO EQUIPMENT SCHEDULE, PLUMBING AND ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
- FURNISH AND INSTALL NEW STAINLESS STEEL COMMERCIAL GRADE HOOD. COMMERCIAL HOOD TO BE INSTALLED ABOVE NEW COMMERCIAL ELECTRIC RANGE. REFER TO EQUIPMENT SCHEDULE, MECHANICAL AND ELECTRICAL DRAWING FOR ADDITIONAL INFORMATION.
- FURNISH AND INSTALL NEW STAINLESS STEEL WORKTABLES WITH INTEGRAL BACKSPLASH AND UNDER COUNTER SHELF. REFER TO INTERIOR ELEVATIONS AND EQUIPMENT SCHEDULE FOR ADDITIONAL INFORMATION.
- FURNISH AND INSTALL NEW STAINLESS STEEL ENCLOSED BASE WORK TABLES WITH HINGED DOORS AND MID SHELVES. REFER TO INTERIOR ELEVATIONS AND EQUIPMENT SCHEDULE FOR ADDITIONAL INFORMATION.
- FURNISH AND INSTALL NEW STAINLESS STEEL WALL MOUNTED SHELVING WITH BULLNOSE FRONT EDGE AND REAR LEG TURN-UP. REFER TO INTERIOR ELEVATIONS AND EQUIPMENT SCHEDULE FOR ADDITIONAL INFORMATION.
- FURNISH AND INSTALL NEW FRP WALL PANELS SYSTEM INCLUDING BUT NOT LIMITED TO TRIM, EXPANSION JOINTS, WALL PANELS AND ADHESIVE). FRP WALL PANEL SYSTEM TO RETURN INTO WINDOW WALL JAMBS. PREPARE EXISTING WALL SURFACE IN ACCORDANCE WITH FRP MANUFACTURER'S REQUIREMENTS TO ENSURE A PROPER INSTALLATION. REFER TO INTERIOR ELEVATIONS FOR ADDITIONAL INFORMATION.
- FURNISH AND INSTALL NEW STAINLESS STEEL WALL MOUNTED CABINET WITH SLIDING DOORS AND MID SHELF. REFER TO INTERIOR ELEVATIONS AND EQUIPMENT SCHEDULE FOR ADDITIONAL INFORMATION.
- FURNISH AND INSTALL NEW QUARRY TILE TO MATCH EXISTING AS REQUIRED. PREPARE FLOORING SUBSTRATE TO RECEIVE NEW QUARRY TILE.
- FURNISH AND INSTALL NEW PVC WINDOW SILL AT EACH WINDOW LOCATION. PREPARE SUBSTRATE TO ENSURE A PROPER AND COMPLETE INSTALLATION. PROVIDE CONTINUOUS SEALANT JOINT AT PERIMETER (TRANSITIONS OF DISSIMILAR MATERIALS).
- FURNISH AND INSTALL NEW IMPACT RESISTANT INFILL PANEL AND ASSOCIATED MATERIALS. CLEAN AND PREP EXISTING WINDOW COMPONENTS IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS TO ENSURE A PROPER AND COMPLETE INSTALLATION. SEAL (INTERIOR/EXTERIOR) PERIMETER OF THE PANEL EDGES IN ACCORDANCE WITH THE MANUFACTURER'S REQUIREMENTS. COORDINATE WITH MECHANICAL FOR THROUGH PANEL DUCTWORK. SEAL DUCT PERIMETER (INTERIOR/EXTERIOR) WITH APPROVED SEALANT. REFER TO MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION.
- EXISTING TO REMAIN FIRE ALARM CONTROL PANEL TO REMAIN OPERATIONAL FOR THE DURATION OF THE PROJECT. CONTRACTOR TO TAKE ALL MEANS NECESSARY TO PROTECT THE EXISTING TO REMAIN FIRE ALARM SYSTEM OPERATIONAL FOR THE DURATION OF THE PROJECT.
- FURNISH & INSTALL MANUAL HORIZONTAL SOLAR ROLL SHADE SYSTEM, SIMILAR OR EQUAL TO MEGHO SHADE, MODEL NO. MEGHO 5 INCLUDING CLEAR ANODIZED METAL FASCIA, SINGLE ROLLER, THERMOVEIL FABRIC, DENSE BASKET WEAVE 1500 SERIES 3% OPEN, COLOR 1519 SILVER BIRCH. VERIFY & COORDINATE EXISTING WINDOW OPENINGS PRIOR TO ORDER PLACEMENT.
- FURNISH & INSTALL WINDOW PRIVACY FILM SIMILAR OR EQUAL TO 3M CRYSTAL GLASS FINISH. CLEAN, PREP AND INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION REQUIREMENTS TO ENSURE A COMPLETE AND PROPER INSTALLATION.
- FURNISH & INSTALL NEW METAL LOCKER SIMILAR OR EQUAL TO LYON WELDED COMMAND LOCKER, 24" x 24" x 12". CONTRACTOR TO COORDINATE EXACT LOCATION IN FIELD WITH OWNER AND SECURE TO WALL.
- RE-INSTALL SALVAGED T.V. MONITOR ON WALL. PROVIDE BLOCKING AND HARDWARE AS REQUIRED TO ENSURE A PROPER AND COMPLETE INSTALLATION.

**TYPICAL RCP NOTES**

- CEILING TILES SHALL NOT BE LESS THAN 4" WIDE. IF CEILING TILE INSTALLATION RESULTS IN A TILE BEING LESS THAN 4" IN WIDTH CONTRACTOR SHALL PROVIDE TILE CUT FROM A 24" x 24" TILE OF EQUAL TYPE. NO CEILING TILE DIMENSION SHALL BE GREATER THAN 24" x 24".
- REFER TO MECHANICAL AND ELECTRICAL DRAWINGS FOR ALL FIRE-DETECTION EQUIPMENT, LIGHTING ETC. LOCATED ABOVE CEILING ASSEMBLIES.
- CONTRACTOR SHALL CONSULT ARCHITECT IF ANY DISCREPANCIES EXIST REGARDING LOCATIONS OF EQUIPMENT SHOWN ON MECHANICAL & ELECTRICAL DRAWINGS.
- REFER TO ELECTRICAL DRAWINGS FOR ALL DETECTORS, ETC. LOCATED ABOVE SUSPENDED CEILING ASSEMBLY.
- ALL CEILING MOUNTED ITEMS ARE TO BE CENTERED IN CEILING TILES U.N.O.
- NOT ALL CEILING MOUNTED COMPONENTS ARE SHOWN. REFER TO M.E.P. DRAWINGS FOR ADDITIONAL INFORMATION.

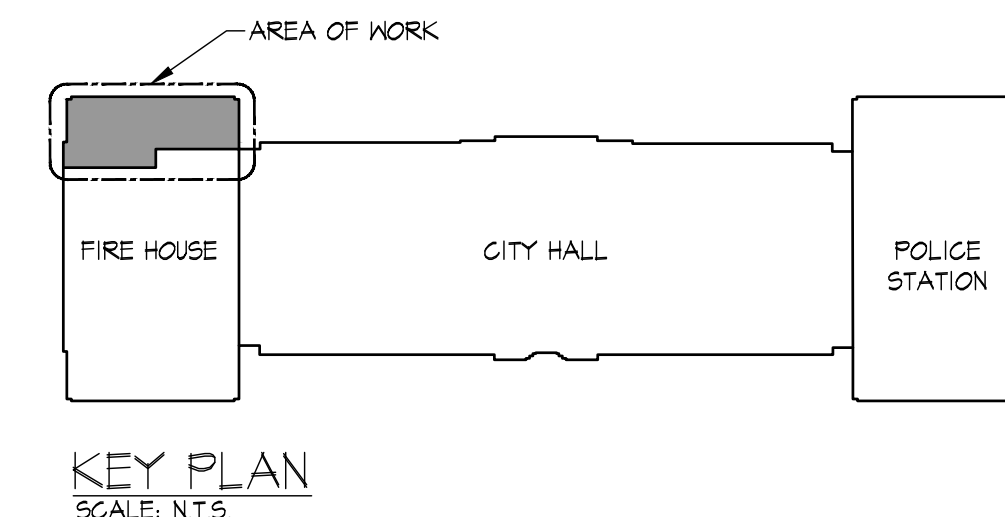
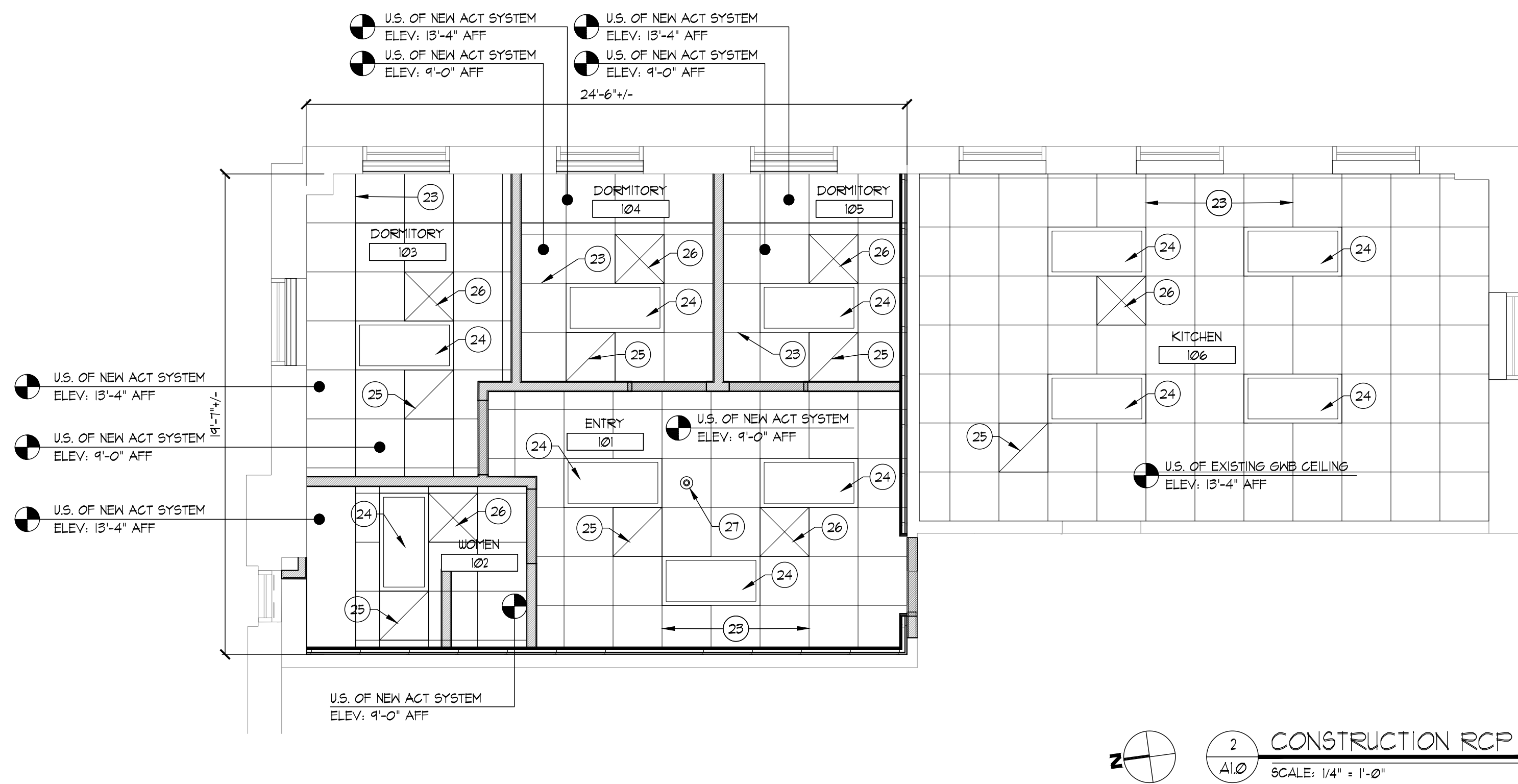
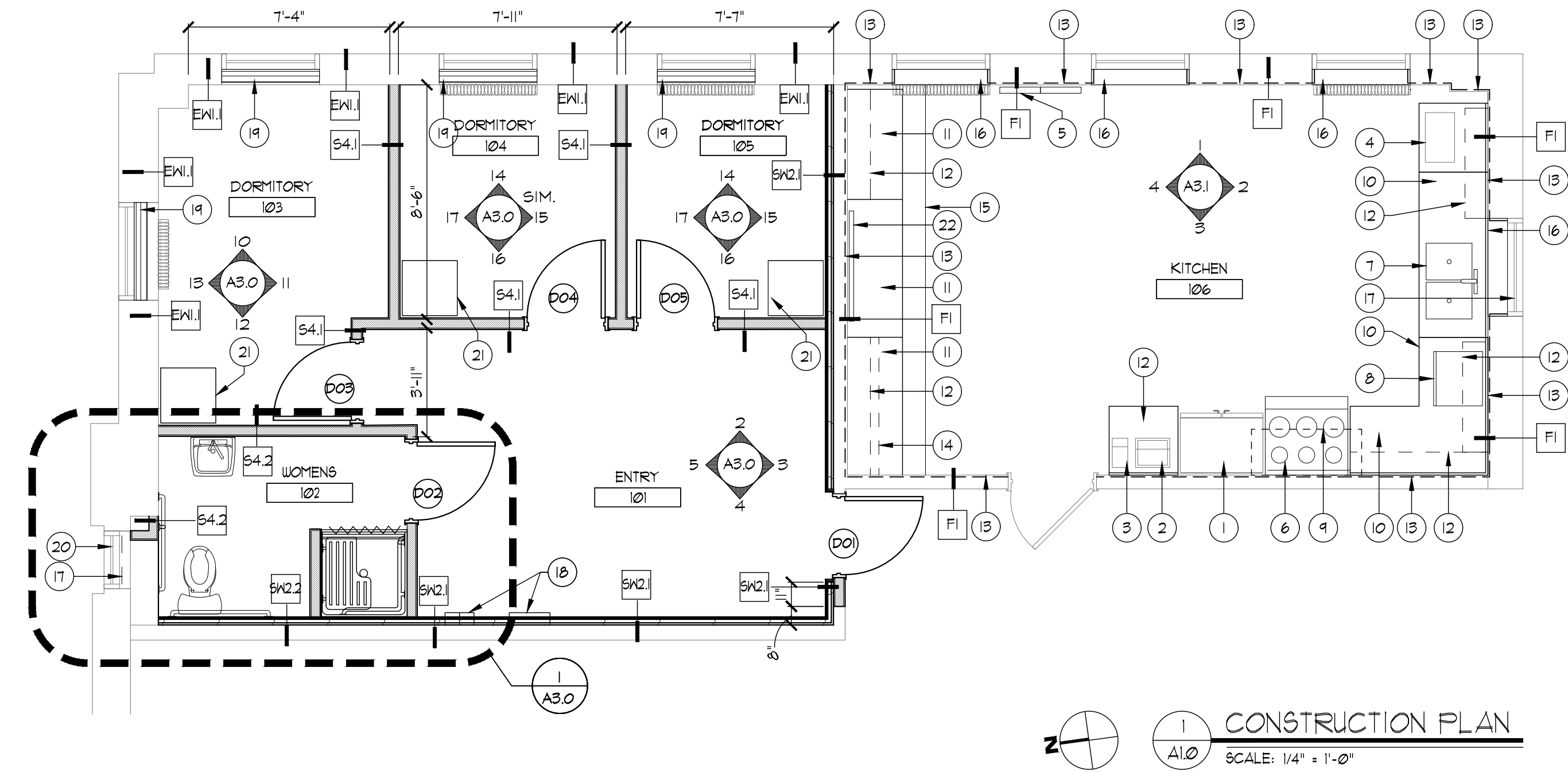
**CONSTRUCTION RCP LEGEND**

	EXISTING CONDITION TO REMAIN		NEW AIR SUPPLY. REFER TO MECHANICAL DRAWINGS
	NEW SUSPENDED 2X2 ACOUSTICAL CEILING SYSTEM		NEW AIR RETURN GRILLE. REFER TO MECHANICAL DRAWINGS
	NEW 2X4 LIGHT FIXTURE. REFER TO ELECTRICAL DRAWINGS		NEW SMOKE DETECTOR. REFER TO ELECTRICAL DRAWINGS

**NOTE:**  
1. ALL DIMENSIONS, UNLESS NOTED OTHERWISE, ARE FROM F.O. STUD/CONCRETE/MASONRY TO F.O. STUD/CONCRETE/MASONRY.

**CONSTRUCTION RCP KEY NOTES**

- FURNISH AND INSTALL NEW SUSPENDED 2x2 ACOUSTICAL CEILING SYSTEM INCLUDING BUT NOT LIMITED TO CEILING GRID COMPONENTS, CEILING PANELS, WIRE TIEBACKS AND TRIM. INSTALL CEILING SYSTEM IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION REQUIREMENTS TO ENSURE A COMPLETE AND PROPER INSTALLATION.
- FURNISH AND INSTALL NEW 2x4 LIGHT FIXTURE. REFER TO ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
- FURNISH AND INSTALL NEW AIR RETURN GRILLE. REFER TO MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION.
- FURNISH AND INSTALL NEW AIR SUPPLY GRILLE. REFER TO MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION.
- FURNISH AND INSTALL NEW OCCUPANCY SENSOR. REFER TO ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.



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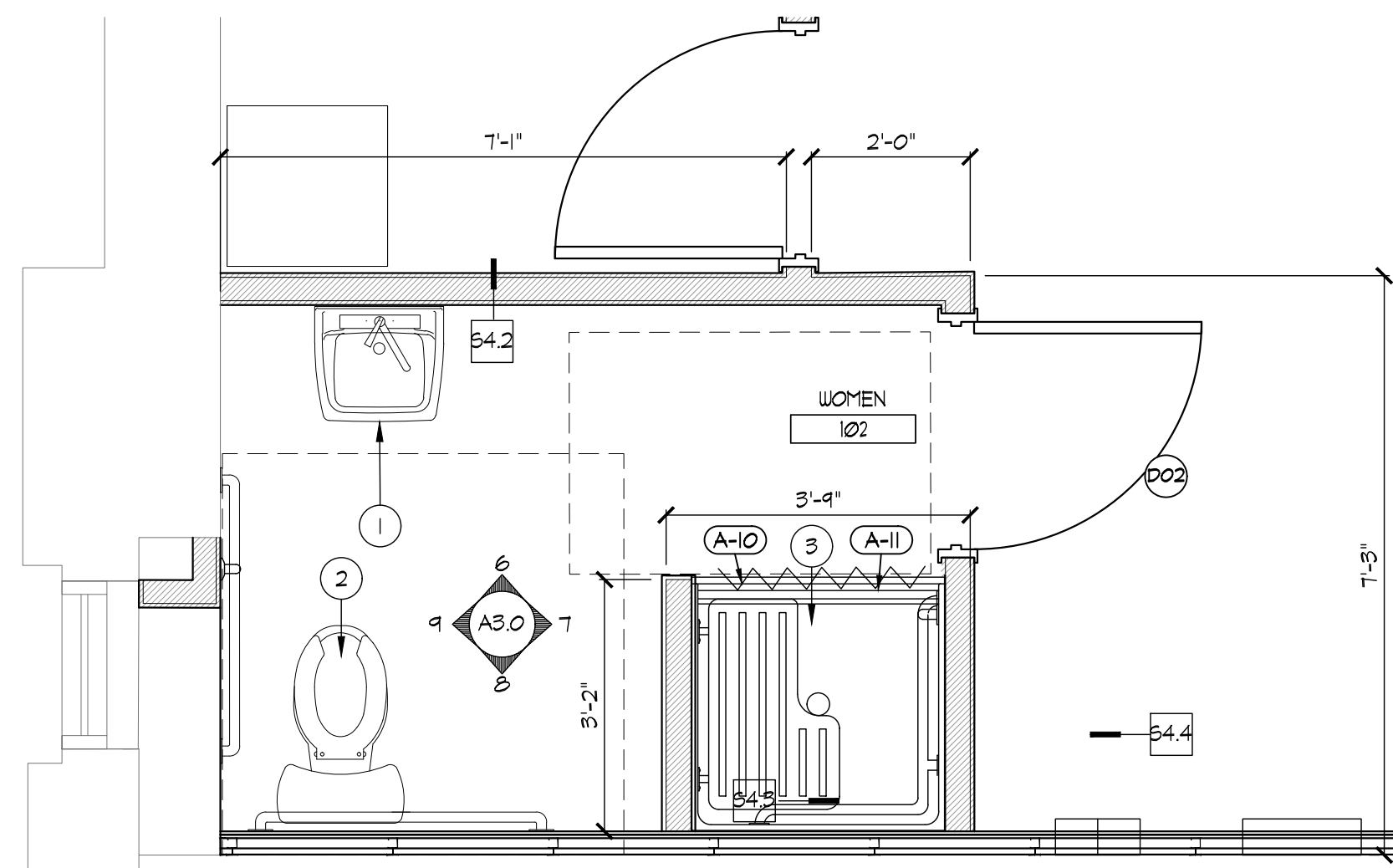
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RESTROOM 102  
SCALE: 1/2" = 1'-0"

INTERIOR ELEVATION KEY NOTES

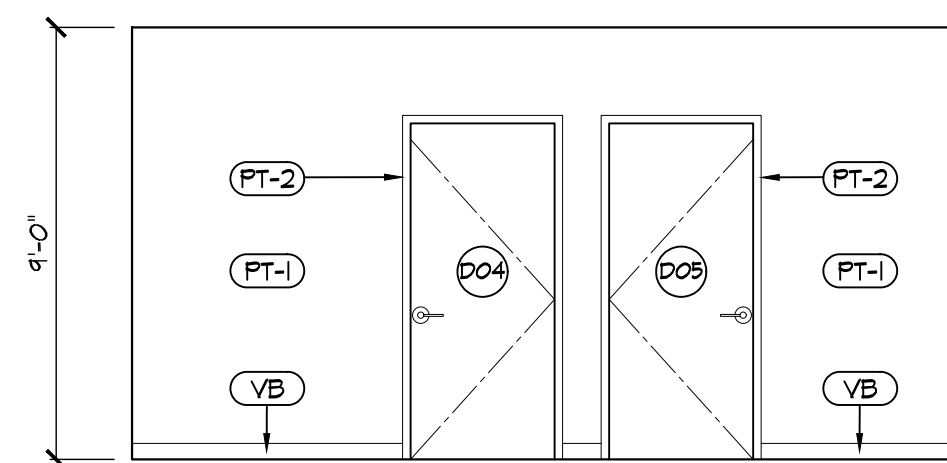
- 1. FURNISH AND INSTALL NEW SINK AND ACCESSORY COMPONENTS. REFER TO PLUMBING DRAWINGS FOR ADDITIONAL INFORMATION.
2. FURNISH AND INSTALL NEW WATER CLOSET AND ACCESSORY COMPONENTS. REFER TO PLUMBING DRAWINGS FOR ADDITIONAL INFORMATION.
3. FURNISH AND INSTALL NEW PRE-FABRICATED TRANSFER SHOWER COMPARTMENT WITH INTEGRAL GRAB BAS AND SHOWER CURTAIN ROD. REFER TO PLUMBING DRAWINGS FOR ADDITIONAL INFORMATION.
4. FURNISH AND INSTALL NEW IMPACT RESISTANT INFILL PANEL AND ASSOCIATED MATERIALS. CLEAN AND PREP EXISTING WINDOW COMPONENTS IN ACCORDANCE WITH MANUFACTURERS REQUIREMENTS TO ENSURE A PROPER AND COMPLETE INSTALLATION. SEAL (INTERIOR/EXTERIOR) PERIMETER OF THE PANEL EDGES IN ACCORDANCE WITH THE MANUFACTURERS REQUIREMENTS. COORDINATE WITH MECHANICAL FOR THROUGH PANEL DUCTWORK. SEAL DUCT PERIMETER (INTERIOR/EXTERIOR) WITH APPROVED SEALANT. REFER TO MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION.
5. EXISTING RADIATOR TO REMAIN.
6. EXISTING TO REMAIN FIRE ALARM CONTROL PANEL TO REMAIN OPERATIONAL FOR THE DURATION OF THE PROJECT. CONTRACTOR TO TAKE ALL MEANS NECESSARY TO PROTECT THE EXISTING TO REMAIN FIRE ALARM SYSTEM OPERATIONAL FOR THE DURATION OF THE PROJECT.
7. FURNISH & INSTALL MANUAL HORIZONTAL SOLAR ROLL SHADE SYSTEM, SIMILAR OR EQUAL TO MEGHO SHADE, MODEL NO. MEGHO 5 INCLUDING CLEAR ANODIZED METAL FASCIA, SINGLE ROLLER, THERMOVELL FABRIC, DENSE BASKET WEAVE 1500 SERIES 3/8 OPEN, COLOR 1519 SILVER BIRCH. VERIFY & COORDINATE EXISTING WINDOW OPENINGS PRIOR TO ORDER PLACEMENT.
8. FURNISH & INSTALL NEW METAL LOCKER SIMILAR OR EQUAL TO LYON WELDED COMMAND LOCKER, 24" X 24" X 12". CONTRACTOR TO COORDINATE EXACT LOCATION IN FIELD WITH OWNER AND SECURE TO WALL.

TOILET ROOM ACCESSORIES

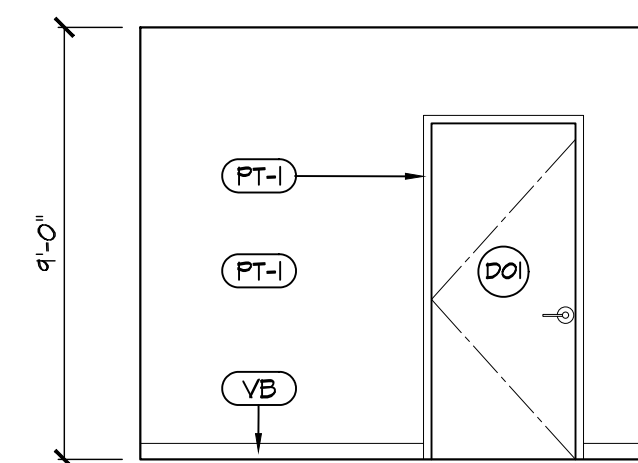
Table with 3 columns: TAG, TYPE, COMMENTS. Lists items like Grab Bar, Paper Towel Dispenser, Mirror, Napkin Disposal, Soap Dispenser, Toilet Paper Dispenser, Coat Hook, Shower Curtain Hook, and Shower Curtain.

GENERAL NOTES

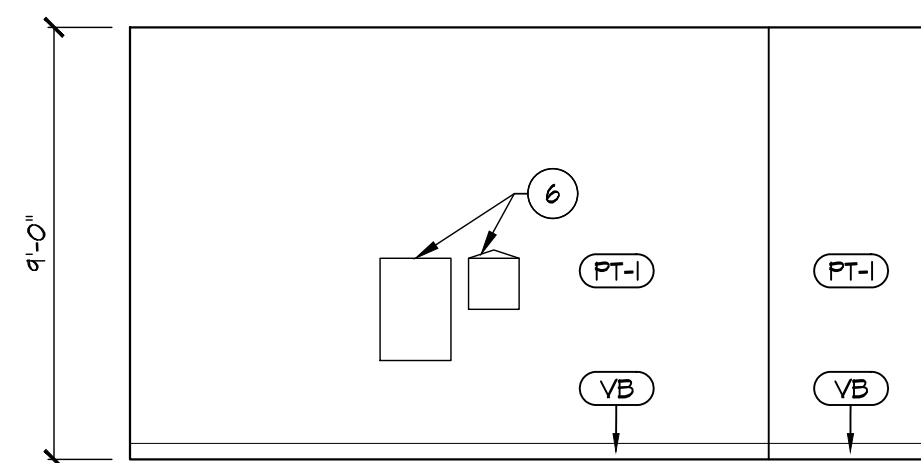
- 1. ALL DIMENSIONS, UNLESS NOTED OTHERWISE, ARE FROM FACE OF FINISH SURFACES.
2. COORDINATE ALL PLUMBING FIXTURES WITH PLUMBING DRAWINGS.
3. DOOR CASING SHOWN ON THIS SHEET ARE FOR REFERENCE ONLY. REFER TO DOOR SCHEDULE ON SHEET A1.0 FOR ADDITIONAL INFORMATION.
4. ELECTRICAL CONTRACTOR TO COORDINATE ALL APPLIANCES POWER WITH ELECTRICAL DRAWINGS.
5. PROVIDE CONCEALED SOLID BLOCKING FOR INSTALLATION OF APPLIANCES, FIXTURES, FURNITURE, CABINETS, ETC.
6. REFER TO FINISH SCHEDULE FOR ALL SELECTED FINISHES.



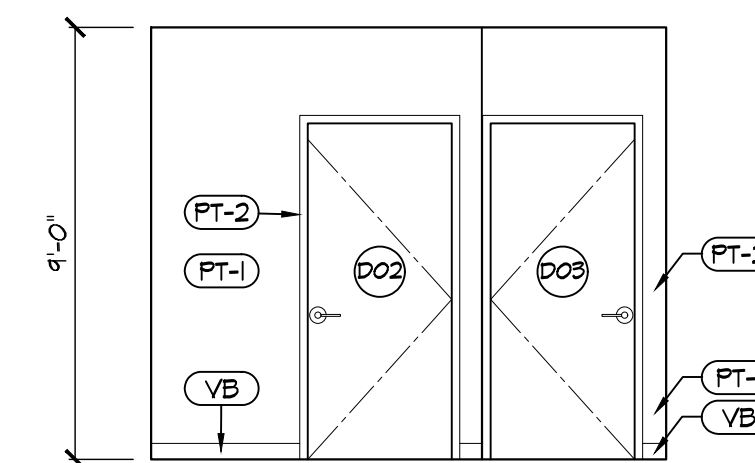
EAST ELEVATION ENTRY 101  
SCALE: 1/4" = 1'-0"



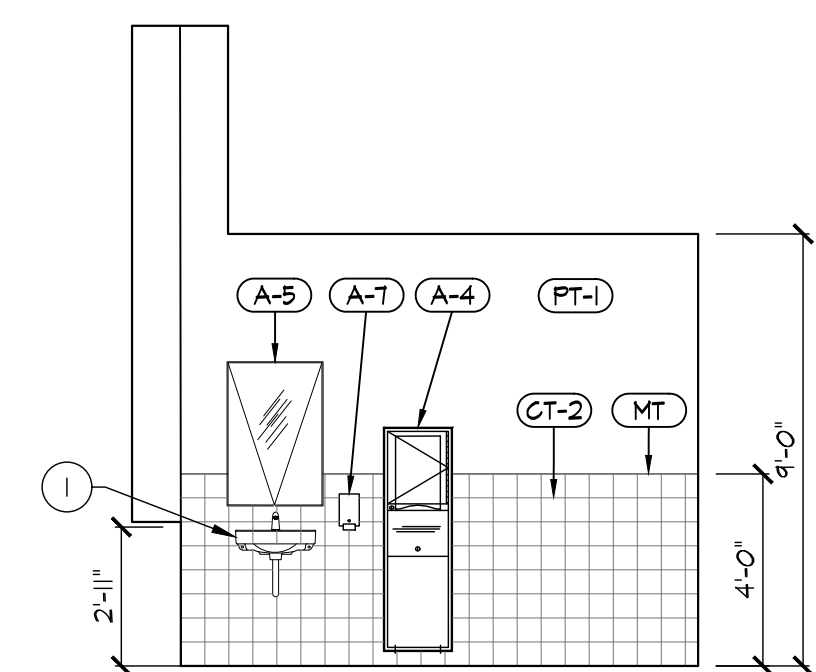
SOUTH ELEVATION ENTRY 101  
SCALE: 1/4" = 1'-0"



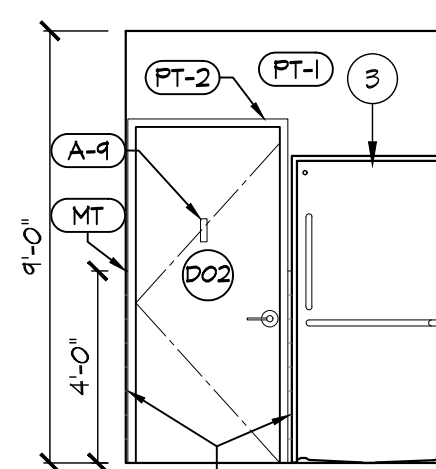
WEST ELEVATION ENTRY 101  
SCALE: 1/4" = 1'-0"



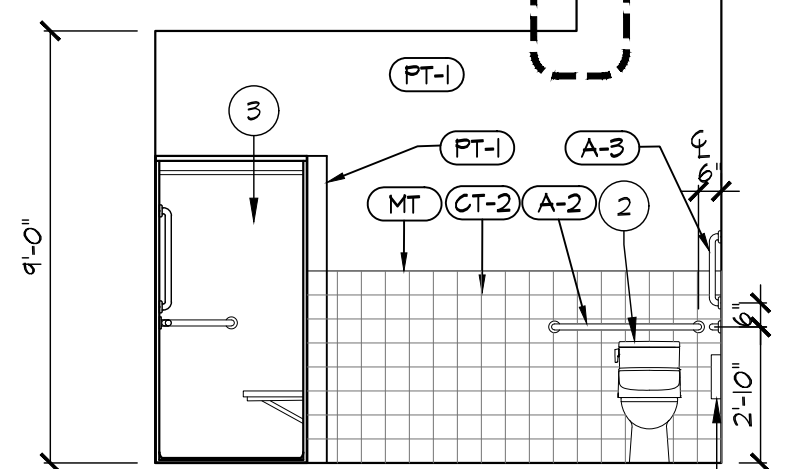
NORTH ELEVATION ENTRY 101  
SCALE: 1/4" = 1'-0"



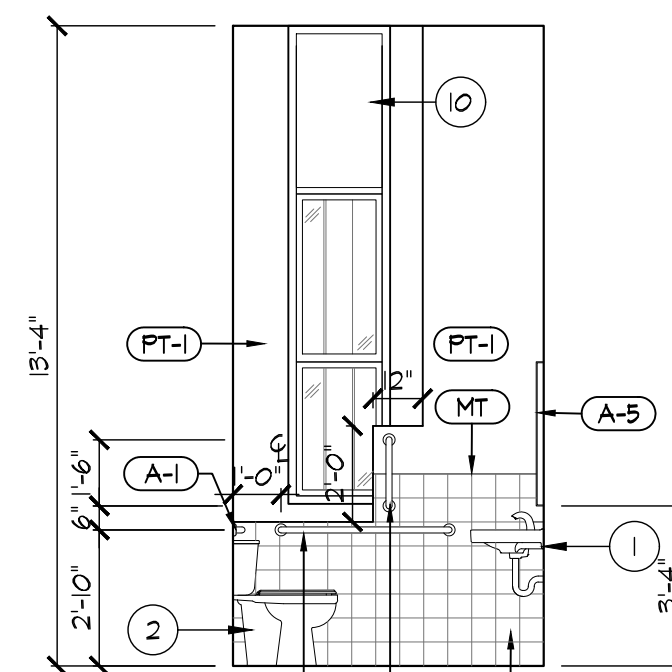
WOMEN-EAST ELEVATION  
SCALE: 1/4" = 1'-0"



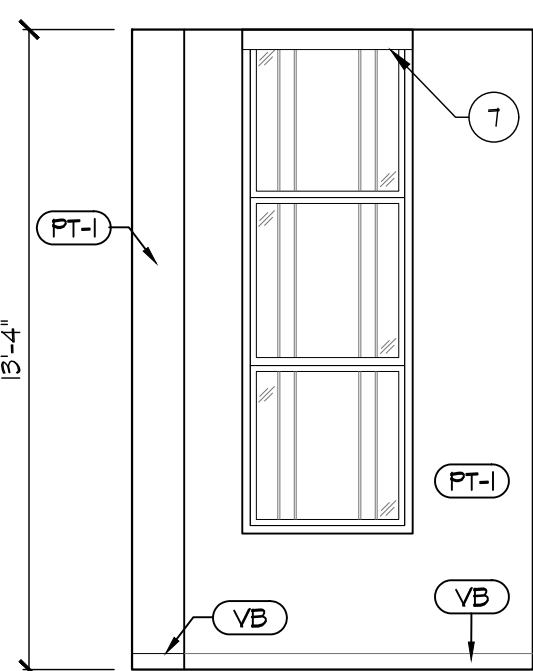
WOMEN-SOUTH ELEVATION  
SCALE: 1/4" = 1'-0"



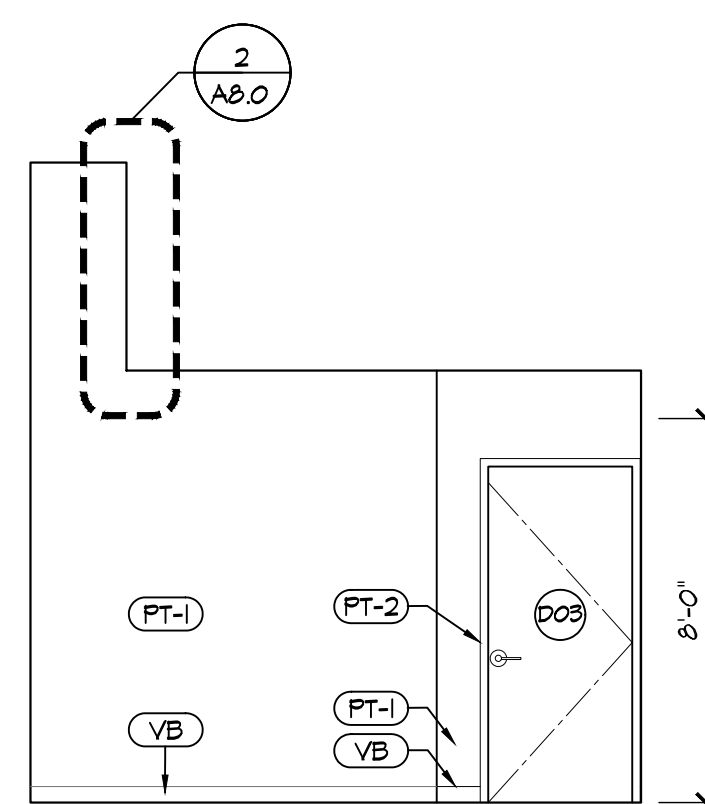
WOMEN-WEST ELEVATION  
SCALE: 1/4" = 1'-0"



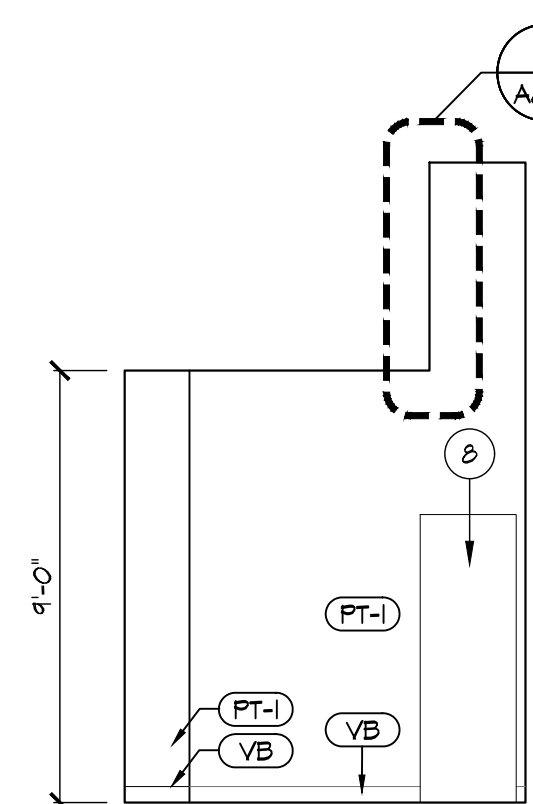
WOMEN-NORTH ELEVATION  
SCALE: 1/4" = 1'-0"



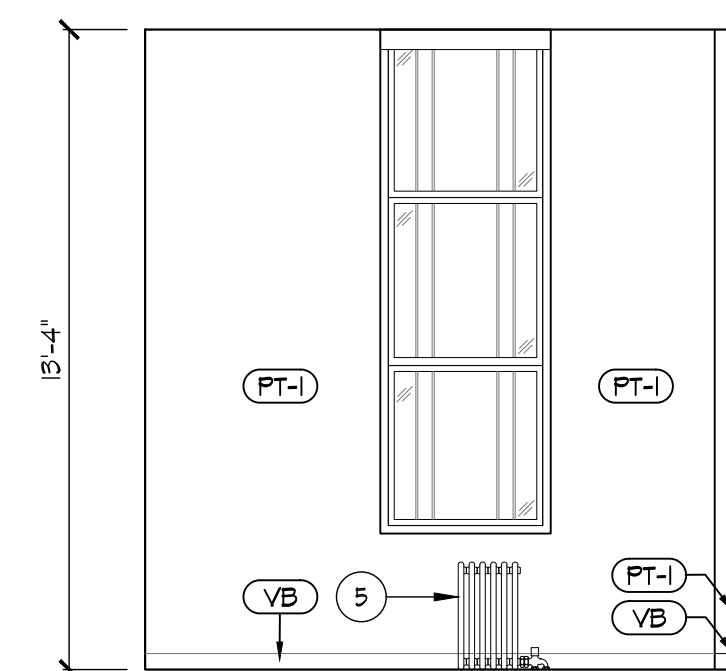
EAST ELEVATION DORMITORY 103  
SCALE: 1/4" = 1'-0"



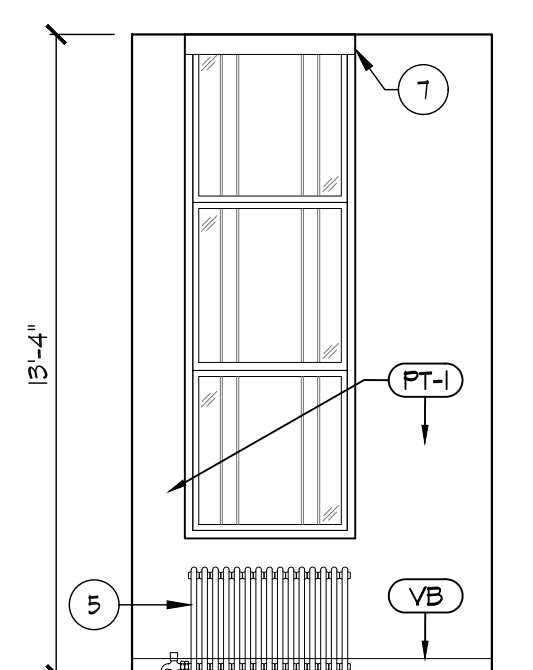
SOUTH ELEVATION DORMITORY 103  
SCALE: 1/4" = 1'-0"



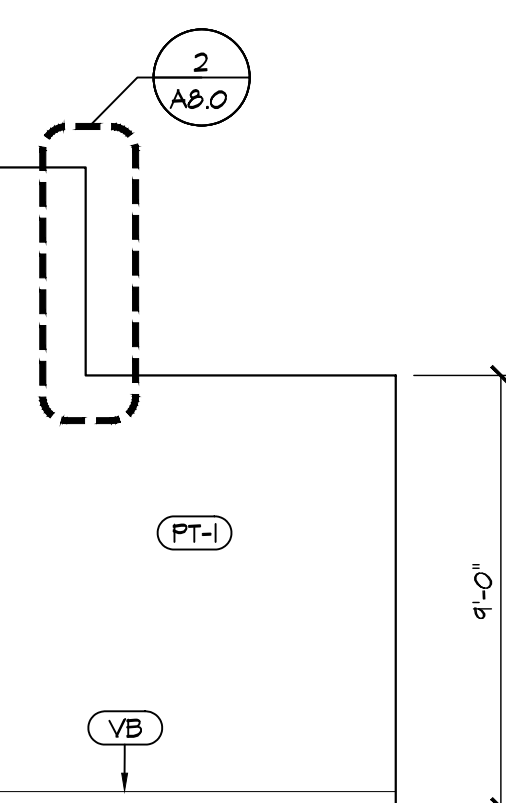
WEST ELEVATION DORMITORY 103  
SCALE: 1/4" = 1'-0"



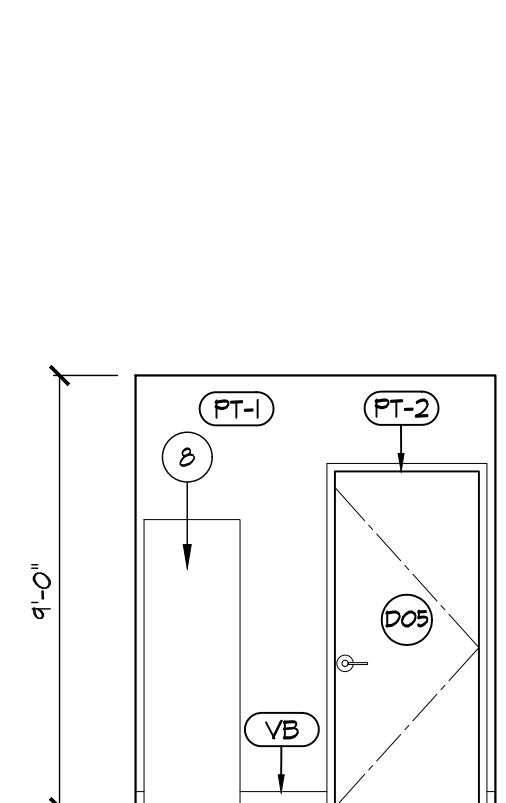
NORTH ELEVATION DORMITORY 103  
SCALE: 1/4" = 1'-0"



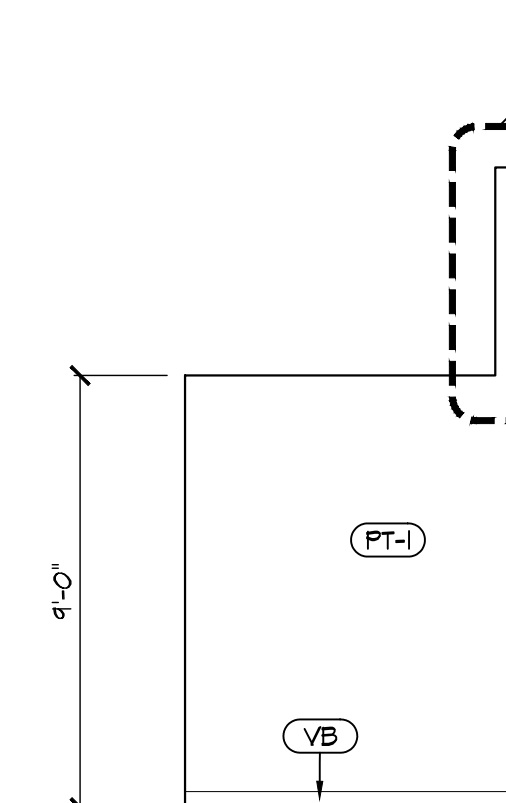
EAST ELEVATION DORMITORY 104/105  
SCALE: 1/4" = 1'-0"



SOUTH ELEVATION DORMITORY 104/105  
SCALE: 1/4" = 1'-0"



WEST ELEVATION DORMITORY 104/105  
SCALE: 1/4" = 1'-0"



NORTH ELEVATION DORMITORY 104/105  
SCALE: 1/4" = 1'-0"

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PAWTUCKET CITY HALL FIRE DEPARTMENT RESCUE ROOM & KITCHEN RENOVATIONS

137 ROOSEVELT AVE  
PAWTUCKET, RI 02860

Scale As Noted  
Date 04-29-2022  
Drawn by CA/MP  
Reviewed by RJ  
Job No. 21-272

Drawing Name  
RESCUE ROOM INTERIOR ELEVATIONS & ENLARGED RESTROOM PLAN

Drawing No.

A3.0

Issued for Bid



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**INTERIOR ELEVATION KEY NOTES**

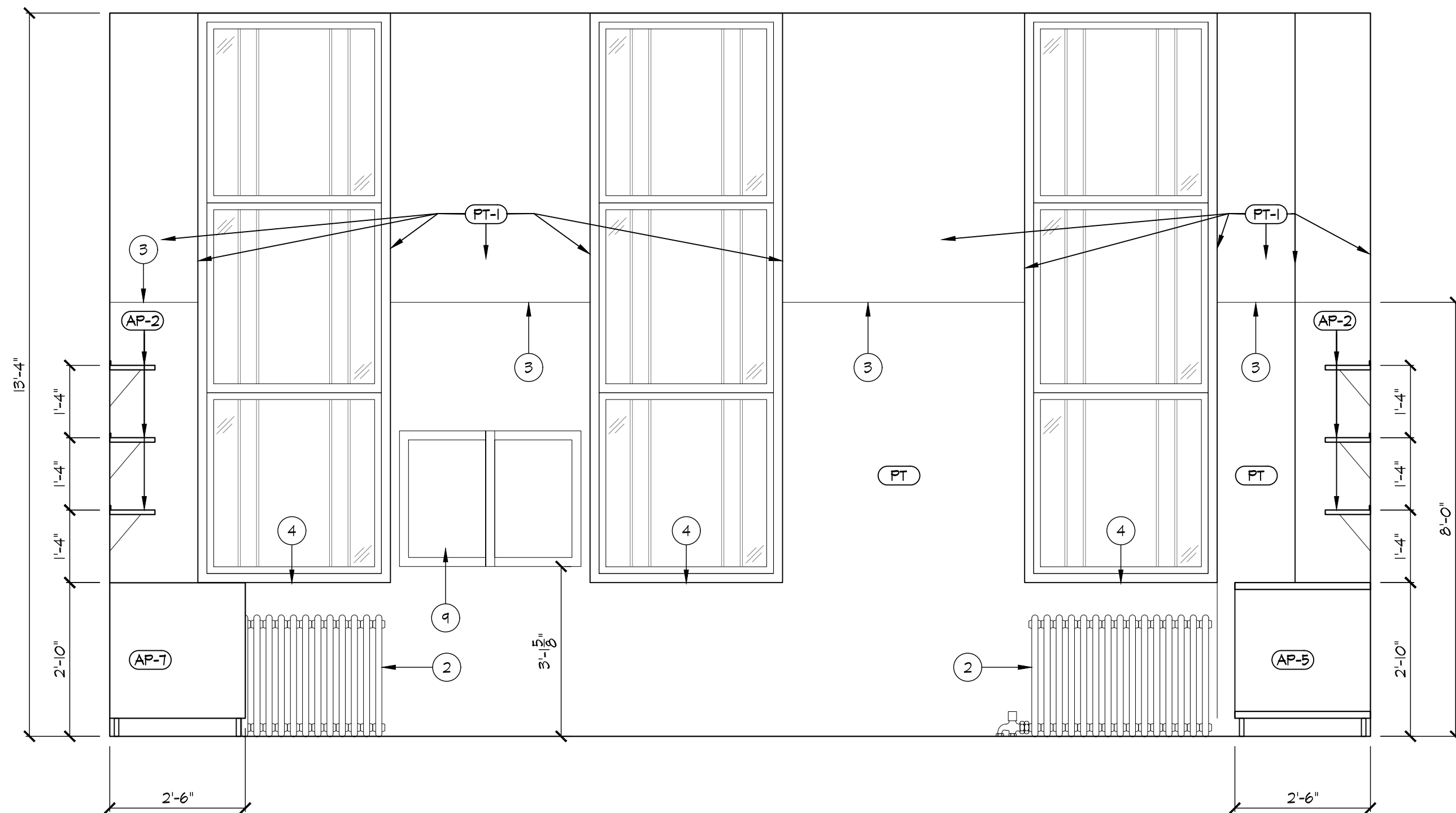
- FURNISH AND INSTALL NEW IMPACT RESISTANT INFILL PANEL AND ASSOCIATED MATERIALS. CLEAN AND PREP EXISTING WINDOW COMPONENTS IN ACCORDANCE WITH MANUFACTURERS REQUIREMENTS TO ENSURE A PROPER AND COMPLETE INSTALLATION. SEAL (INTERIOR/EXTERIOR) PERIMETER OF THE PANEL EDGES IN ACCORDANCE WITH THE MANUFACTURERS REQUIREMENTS. COORDINATE WITH MECHANICAL FOR THROUGH PANEL DUCTWORK; SEAL DUCT PERIMETER (INTERIOR/EXTERIOR) WITH APPROVED SEALANT. REFER TO MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION.
- EXISTING RADIATOR TO REMAIN.
- FURNISH AND INSTALL NEW FRP WALL PANELS SYSTEM INCLUDING BUT NOT LIMITED TO TRIM, EXPANSION JOINTS, WALL PANELS AND ADHESIVE). FRP WALL PANEL SYSTEM TO RETURN INTO WINDOW WALL JAMBS. PREPARE EXISTING WALL SURFACE IN ACCORDANCE WITH FRP MANUFACTURER'S REQUIREMENTS TO ENSURE A PROPER INSTALLATION. REFER TO INTERIOR ELEVATIONS FOR ADDITIONAL INFORMATION.
- FURNISH AND INSTALL NEW PVC WINDOW SILL AT EACH WINDOW LOCATION. PREPARE SUBSTRATE TO ENSURE A PROPER AND COMPLETE INSTALLATION. PROVIDE CONTINUOUS SEALANT JOINT AT PERIMETER (TRANSITIONS OF DISSIMILAR MATERIALS).
- RE-INSTALL SALVAGED ICE MAKER MACHINE.
- RE-INSTALL SALVAGED COFFEE MACHINE.
- RE-INSTALL SALVAGED REFRIGERATOR.
- RE-INSTALL SALVAGED MICROWAVE.
- RE-INSTALL SALVAGED 2-DOOR DISPLAY CASE.
- RE-INSTALL SALVAGED T.V. MONITOR, PROVIDE BLOCKING AND HARDWARE AS REQUIRED FOR WALL MOUNT INSTALLATION.
- FABRICATE NEW STAINLESS STEEL METAL PANELS INSTALL BENEATH STAINLESS STEEL COUNTERTOPS AND ON EACH SIDE OF DISHWASHER. SECURE TO UNDERSIDE OF METAL COUNTERTOPS AND EXISTING QUARRY TILE FLOOR. REFER TO EQUIPMENT SCHEDULE, PLUMBING AND ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
- EXISTING DOOR TO REMAIN.

**APPLIANCE/EQUIPMENT SCHEDULE**

TAG	TYPE	COMMENTS
AP-1	STAINLESS STEEL WALL MOUNTED SHELF	60"(L) X 10"(W)
AP-2	STAINLESS STEEL WALL MOUNTED SHELF	48"(L) X 10"(W)
AP-3	STAINLESS STEEL WALL MOUNTED CABINET	SLIDING DOORS & MID SHELF
AP-4	STAINLESS STEEL WORK TABLE WITH INTEGRAL SINK & BACKSPASH	6'-0" (L) X 30" (W)
AP-5	STAINLESS STEEL WORK TABLE WITH BACKSPASH AND UNDER SHELF	30" (L) X 30" (W)
AP-6	STAINLESS STEEL CORNER WORK TABLE WITH BACKSPASH	5'-0" (L) X 5'-0" (L) X 30" (W)
AP-7	STAINLESS STEEL ENCLOSED BASE WORK TABLE WITH MID SHELF	5'-0" (L) X 5'-0" (L) X 30" (W)
AP-8	DISHWASHER	
AP-9	ELECTRIC RANGE OVEN	
AP-10	RANGE HOOD	
AP-11	STAINLESS STEEL ENCLOSED BASE WORK TABLE WITH MID SHELF	4'-0" (L) X 5'-0" (L) X 30" (W)

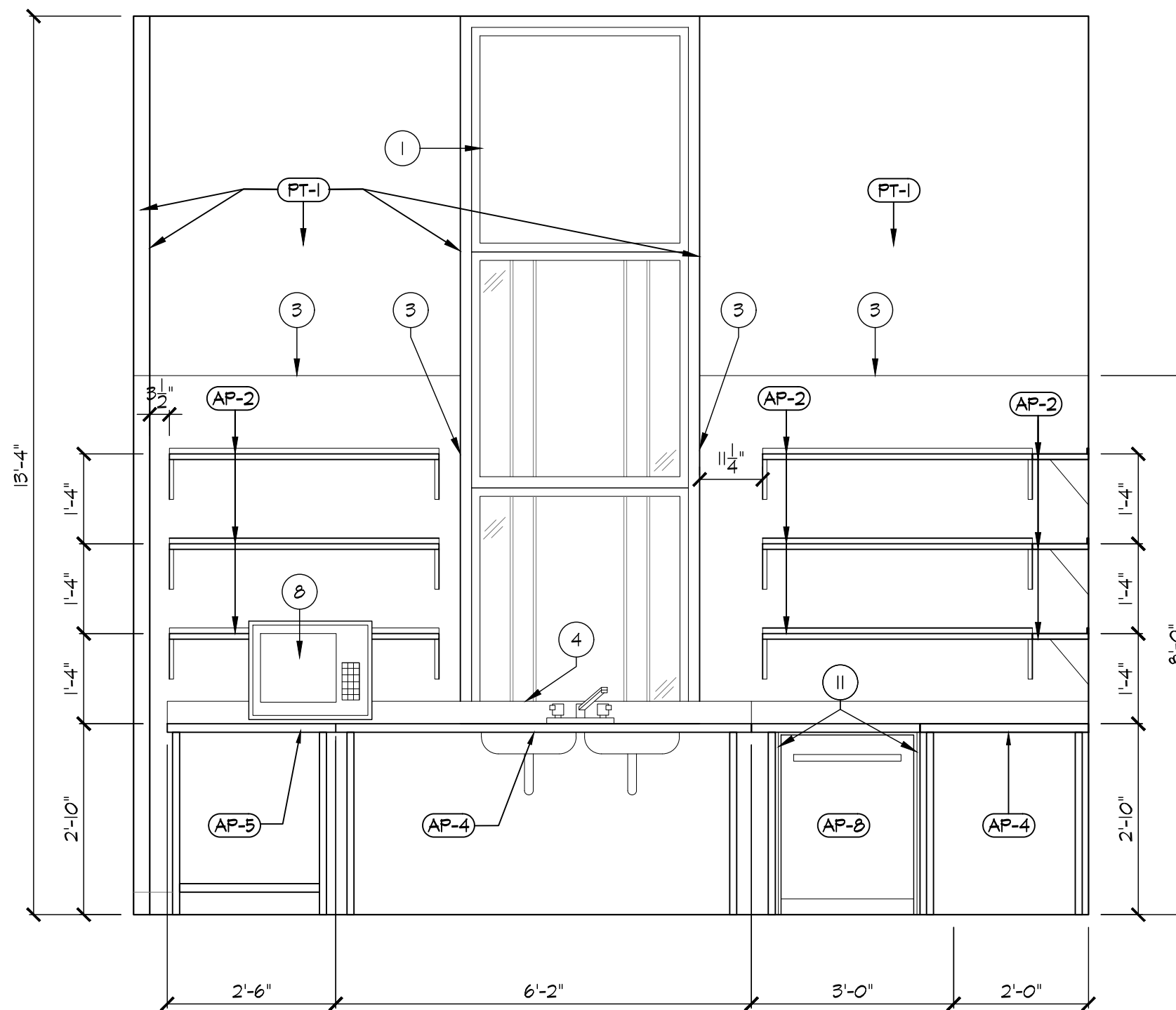
**GENERAL NOTES**

- ALL DIMENSIONS, UNLESS NOTED OTHERWISE, ARE FROM FACE OF FINISH SURFACES.
- COORDINATE ALL PLUMBING FIXTURES WITH PLUMBING DRAWINGS.
- ELECTRICAL CONTRACTOR TO COORDINATE ALL APPLIANCES POWER WITH ELECTRICAL DRAWINGS.
- DOOR CASING SHOWN ON THIS SHEET ARE FOR REFERENCE ONLY. REFER TO DOOR SCHEDULE ON SHEET A7.0 FOR ADDITIONAL INFORMATION.
- ELECTRICAL CONTRACTOR TO COORDINATE ALL APPLIANCES POWER WITH ELECTRICAL DRAWINGS.
- PROVIDE CONCEALED SOLID BLOCKING FOR INSTALLATION OF APPLIANCES, FIXTURES, FURNITURE, CABINETRY, ETC.
- REFER TO FINISH SCHEDULE FOR ALL SELECTED FINISHES.



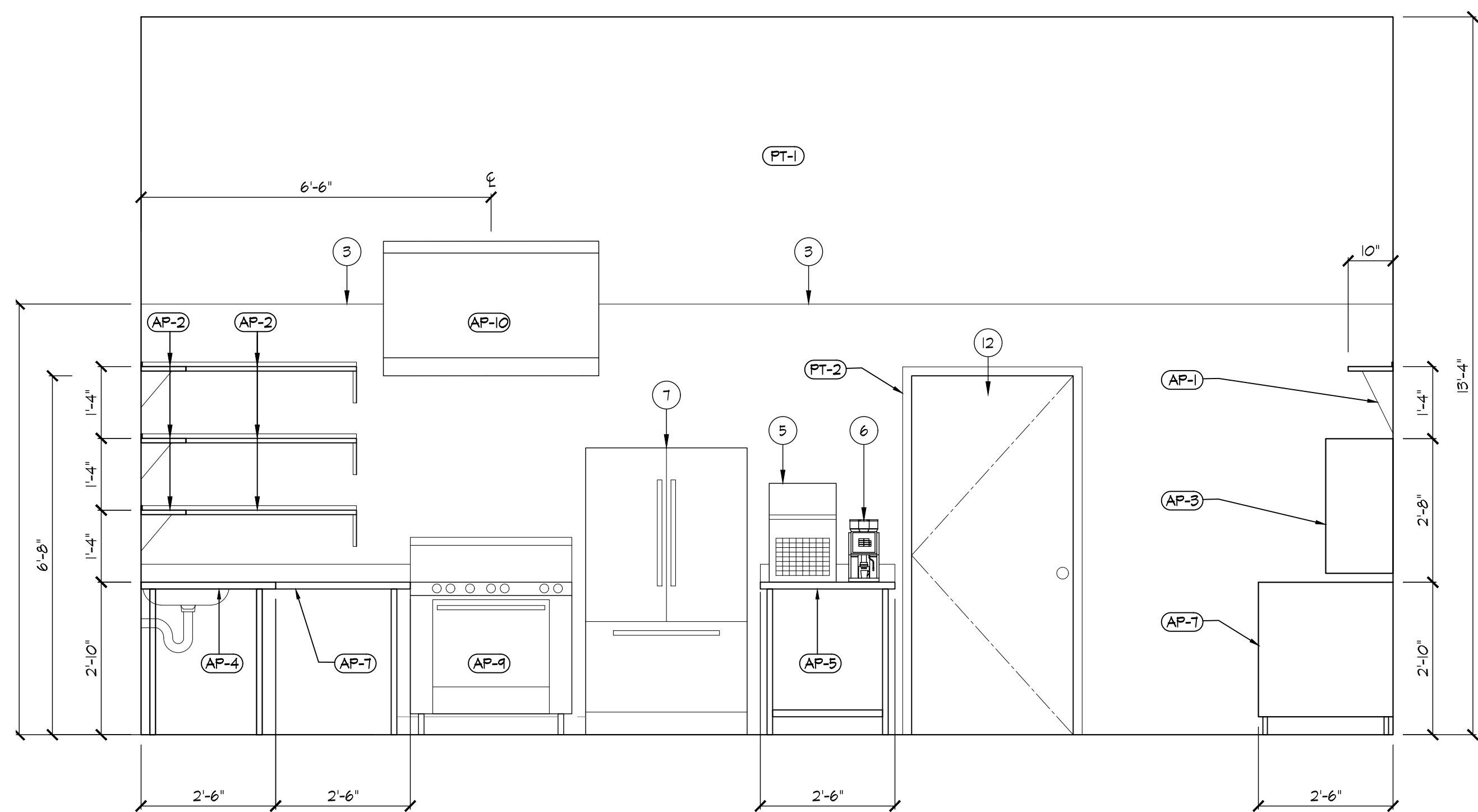
**1 KITCHEN - EAST ELEVATION**

SCALE: 1/2" = 1'-0"



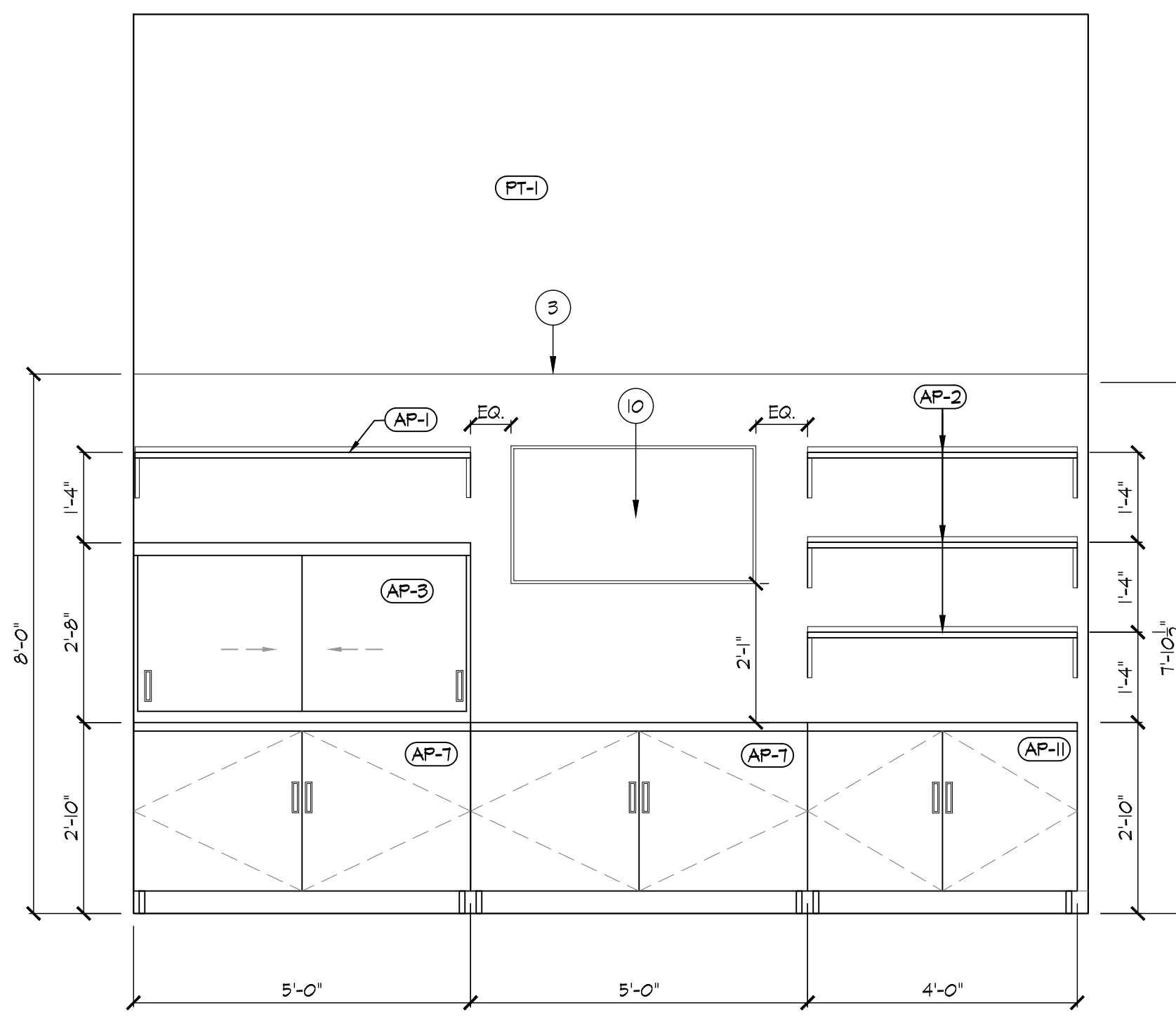
**2 KITCHEN - SOUTH ELEVATION**

SCALE: 1/2" = 1'-0"



**3 KITCHEN - WEST ELEVATION**

SCALE: 1/2" = 1'-0"



**4 KITCHEN - NORTH ELEVATION**

SCALE: 1/2" = 1'-0"

**PAWTUCKET CITY  
HALL FIRE  
DEPARTMENT RESCUE  
ROOM & KITCHEN  
RENOVATIONS**

137 ROOSEVELT AVE  
PAWTUCKET, RI 02860

Scale **As Noted**  
Date **04-29-2022**  
Drawn by **CA/MP**  
Reviewed by **RJ**  
Job No. **21-272**

Drawing Name  
**KITCHEN  
INTERIOR ELEVATIONS**

Drawing No.

**A3.1**

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Scale **As Noted**  
Date **04-29-2022**  
Drawn by **CA/MP**  
Reviewed by **RJ**  
Job No. **21-272**

Drawing Name  
**FINISH PLAN,  
FURNITURE PLAN,  
& SCHEDULES**

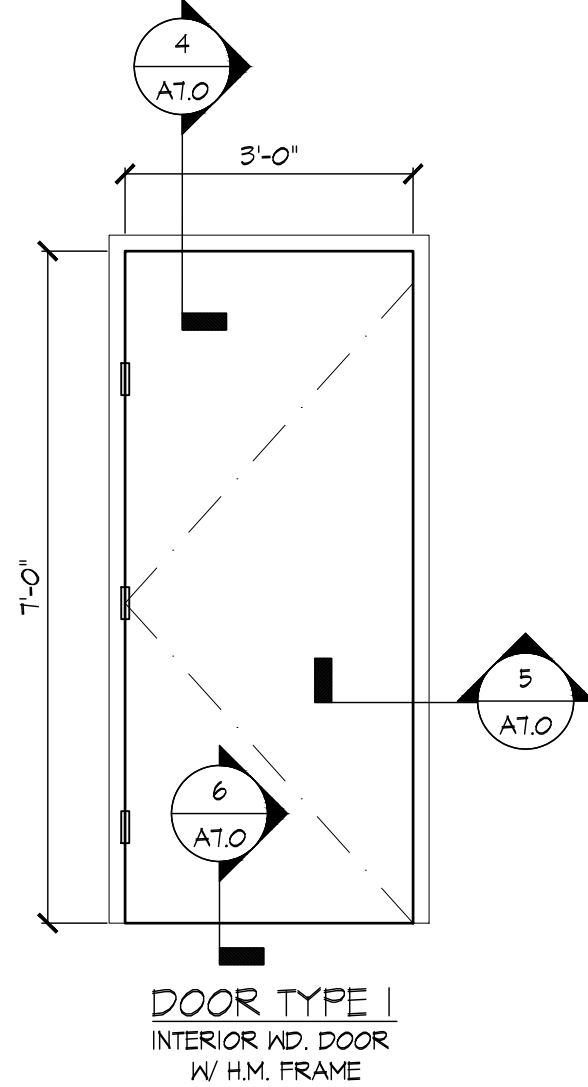
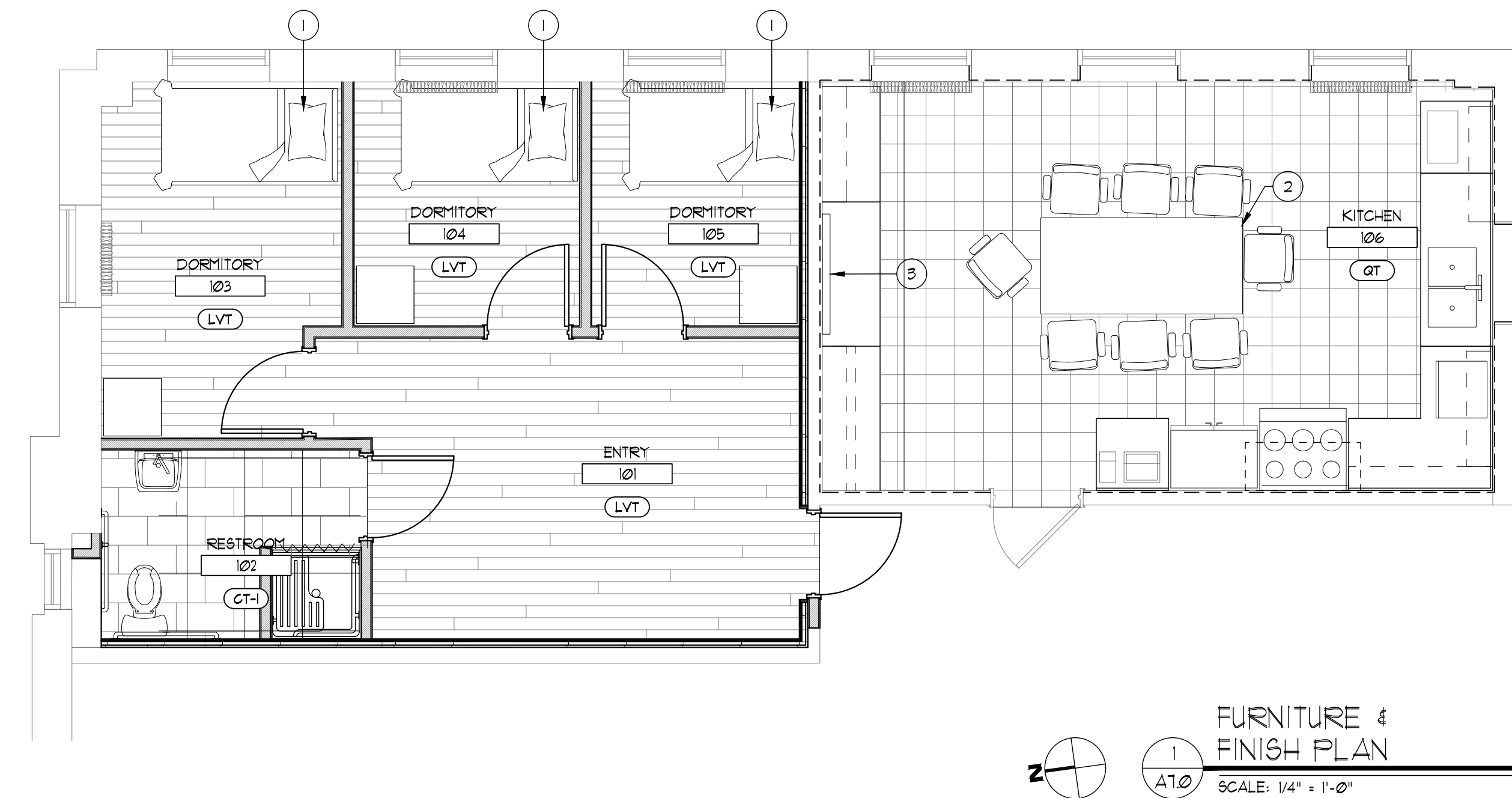
Drawing No.

**A7.0**

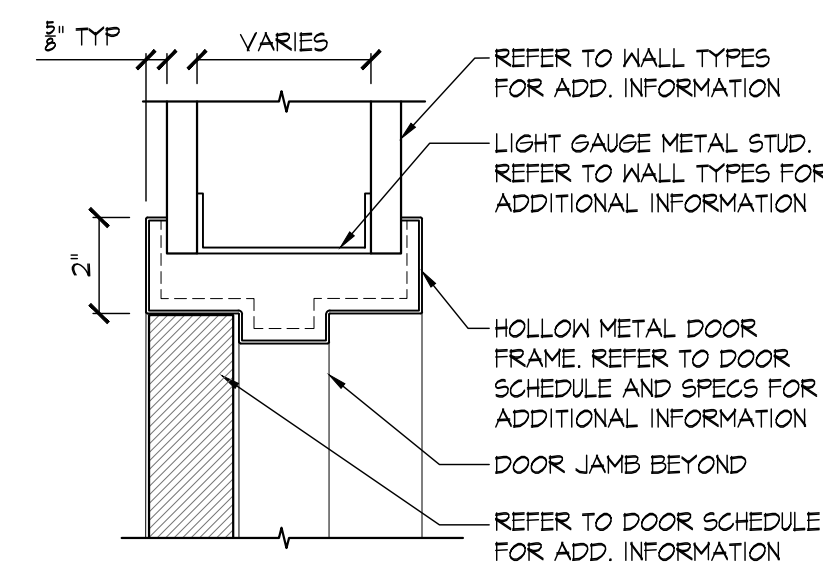
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FINISH MATERIAL LEGEND	
	EXISTING QUARRY TILE TO REMAIN
	CERAMIC FLOOR TILE 12"x24" HORIZONTAL
	LVT 6'x9'

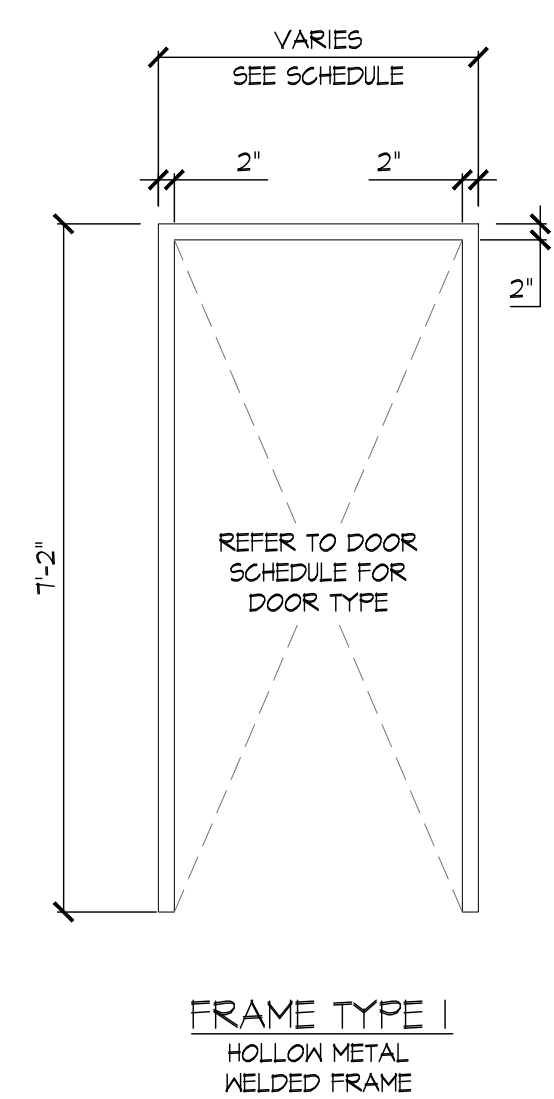
- KEY NOTES**
- ① DORMITORY FURNITURE BY OWNER
  - ② EXISTING SALVAGED KITCHEN TABLE & CHAIRS TO REMAIN.
  - ③ EXISTING SALVAGED WALL-MOUNTED TV



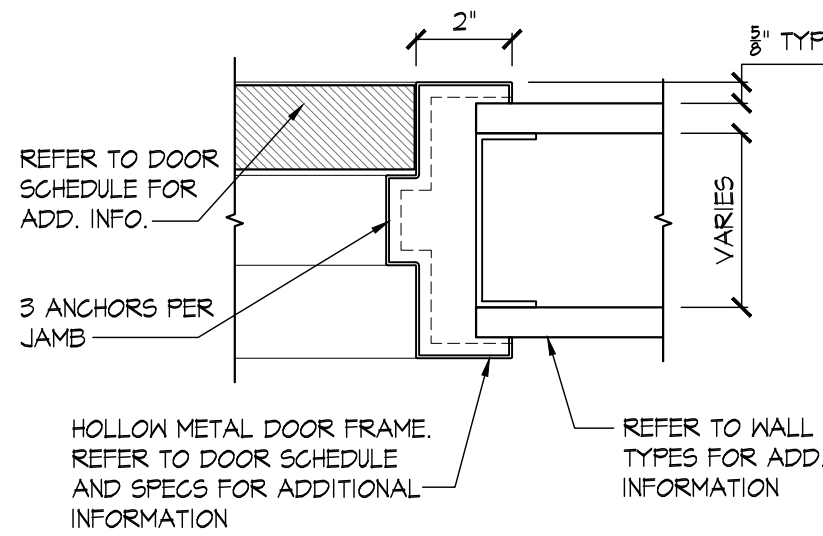
**2 TYPICAL DOOR ELEVATION**  
SCALE: 1/2" = 1'-0"



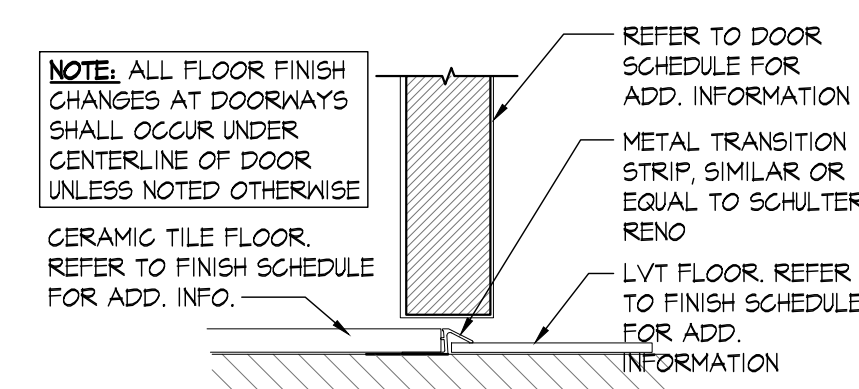
**4 GWB DOOR HEAD DETAIL**  
SCALE: 3" = 1'-0"



**3 TYPICAL DOOR FRAME ELEVATION**  
SCALE: 1/2" = 1'-0"



**5 GWB DOOR JAMB DETAIL**  
SCALE: 3" = 1'-0"



**6 CERAMIC TILE TO LVT TRANSITION DETAIL**  
SCALE: 3" = 1'-0"

RM #	RM NAME	FLOOR FIN.	BASE	WALLS								CEILING		REMARKS
				NORTH		EAST		SOUTH		WEST		MATL.	FIN.	
				SUB.	FIN.	SUB.	FIN.	SUB.	FIN.	SUB.	FIN.			
101	ENTRY	LVT	VB	GWB	PT-1	GWB	PT-1	GWB	PT-1	GWB	PT-1	ACT	-	
102	WOMENS	CT-1	--	CBB/MRGWB	CT-2/MT/PT-1	CBB/MRGWB	CT-2/MT/PT-1	CBB/MRGWB	CT-2/MT/PT-1	MRGWB	CT-2/MT/PT-1	ACT	-	
103	DORMITORY	LVT	VB	PL	PT-1	PL	PT-1	GWB	PT-1	GWB	PT-1	ACT	-	
104	DORMITORY	LVT	VB	GWB	PT-1	PL	PT-1	GWB	PT-1	GWB	PT-1	ACT	-	
105	DORMITORY	LVT	VB	GWB	PT-1	PL	PT-1	GWB	PT-1	GWB	PT-1	ACT	-	
106	KITCHEN	QT	--	PL	FRP/PT-1	PL	FRP/PT-1	PL	FRP/PT-1	PL	FRP/PT-1	ACT	-	

**FINISH LEGEND**

CT-1 - CERAMIC FLOOR TILE 12"x24"	GWB - GYPSUM WALL BOARD.	PT-1 - PAINT	LVT - LUXURY VINYL COMPOSITION TILE.
CT-2 - CERAMIC WALL TILE 6"x6"	MRGWB - MOISTURE RESISTANT GWB.	PT-2 - PAINT	VB - VINYL BASE.
QT - EXISTING QUARRY TILE CONC. - CONCRETE	CBB - CEMENT BACKER BOARD.	ACT - ACOUSTIC CEILING TILE	EX - EXISTING.
	FRP - FIBERGLASS REINFORCED PANELS.	PL - EXISTING PLASTER WALL	MT - METAL TRIM (SCHULTER RONDEC-DB)

- INTERIOR FINISH NOTES**
- THE ROOM FINISH SCHEDULE PROVIDES GENERAL DESCRIPTIONS OF SUBSTRATE MATERIALS FOR FLOORS, WALLS, AND CEILINGS. REFER TO FLOOR, WALL AND CEILING TYPES FOR SPECIFIC SUBSTRATE ASSEMBLY REQUIREMENTS AND SPECIFIC FINISHES.
  - G.C. SHALL SUBMIT MANUFACTURER'S STANDARD COLOR CHARTS FOR ALL SPECIFIED MATERIALS. (COLOR SCHEDULE TO BE COMPLETED UPON RECEIPT AND APPROVAL OF ALL SPECIFIED FINISHES). ALL COLOR SAMPLES SHALL BE SUBMITTED TO THE OWNER AND ARCHITECT SIMULTANEOUSLY. COLOR SELECTIONS WILL NOT BE MADE UNTIL ALL COLOR SAMPLES HAVE BEEN RECEIVED.
  - G.C. SHALL INSTALL WOOD BLOCKING AT ALL AREAS INDICATED TO RECEIVE WALL MOUNTED ITEMS, CABINERY, SHELVING, ETC. COORDINATE IN FIELD.
  - REFER TO REFLECTED CEILING PLANS FOR CEILING HEIGHTS.
  - ALL SPECIFIED FINISHES SHALL BE CONTINUOUS BEHIND ALL MOUNTED OR APPLIED ITEMS, I.E.: TOILETS, WALL CABINETS AND ACCESSORIES.
  - G.C. AND VENDORS SHALL DETERMINE AVAILABILITY OF ALL FINISH MATERIALS. ANY DELIVERY SCHEDULE THAT MAY POTENTIALLY CAUSE COORDINATION PROBLEMS DURING THE FINAL STAGES OF CONSTRUCTION/INSTALLATION SHALL BE IMMEDIATELY BROUGHT TO OWNER AND ARCHITECT'S ATTENTION FOR POSSIBLE RE-EVALUATION OF MATERIAL DESIGNATION. THE LACK OF TIMELY ORDER DOES NOT CONSTITUTE A RE-SELECTION.
  - G.C. SHALL ASSURE THAT NO ELECTRIC RECEPTACLE OR TELECOMMUNICATIONS OUTLET COVERPLATES HAVE BEEN INSTALLED PRIOR TO COMPLETION OF APPLICATION OF ANY WALL FINISH MATERIALS. ANY SUCH COVERPLATES OR SURFACE HARDWARE, ETC., IN PLACE, SHALL BE REMOVED PRIOR TO WALL FINISH APPLICATION.
  - UPON COMPLETION OF THE WORK AND PRIOR TO THE FINAL CLEANING, G.C. SHALL REMOVE ALL PAINT, ETC. FROM WHERE IT HAS SPILLED, SPLASHED, OR SPLATTERED.
  - G.C. RESPONSIBLE FOR FIELD VERIFICATION OF ALL DIMENSIONS, QUANTITIES, ETC. OF THEIR RESPECTIVE WORK.
  - ALL FLOOR FINISH CHANGES AT DOORWAYS SHALL OCCUR UNDER CENTERLINE OF DOOR UNLESS NOTED OTHERWISE.
  - ALL SURFACES TO BE PAINTED SHALL RECEIVE A MINIMUM OF 2 COATS OF PRIMER AND 2 COATS OF PAINT. TYP. REFER TO PAINT SPECIFICATIONS.
  - ALL FINISH FLOORING MATERIAL INSTALLATION SHALL BE PER MANUFACTURER'S RECOMMENDATION AND SPECIFICATIONS. SEAMS SHALL BE MADE TIGHT/INVISIBLE. G.C. SHALL PROVIDE AND MAINTAIN ADEQUATE PROTECTION FOR ALL NEWLY INSTALLED FLOORING MATERIALS FOR THE DURATION OF CONSTRUCTION AND REMOVE PROTECTION ONLY IMMEDIATELY BEFORE JOB COMPLETION. FLOOR SHALL BE THOROUGHLY CLEANED OF ALL ADHESIVE, GROUT, CONSTRUCTION STAINS, ETC.
  - AT ALL GT SHOWERS 2 COATS OF WATERPROOFING MEMBRANE SHALL BE APPLIED OVER THE CEMENT BOARD SUBSTRATE. INSTALL PER MANUFACTURER'S INSTRUCTIONS.
  - PAINT FINISHES ARE TO BE AS FOLLOWS: REFER TO PAINT SPECIFICATIONS FOR ADDITIONAL INFORMATION.
    - WALLS - EGGSHELL FINISH
    - TRIM - SEMI GLOSS FINISH
    - CEILING - MATTE/FLAT FINISH
  - G.C. IS TO PREPARE ALL SUBSTRATE SURFACES PER MFG'S REQUIREMENTS TO RECEIVE FINISHES. REFER TO PAINTING SPECIFICATIONS FOR ADDITIONAL INFORMATION IN REGARD TO SURFACE PREP, APPLICATION, FINISH AND CLEAN-UP.

DOOR HARDWARE SCHEDULE	
(SCHEDULE IS SHOWN TO DEPICT HARDWARE FUNCTION ONLY.)	
SET 1: DORMITORY SET (SLEEPING QUARTERS PRIVACY FUNCTION)	
<ul style="list-style-type: none"> <li>• LEVER SET - PRIVACY FUNCTION</li> <li>• SILENCERS</li> <li>• WALL STOP</li> <li>• 5 KNUCKLE FULL MORTISE HINGES</li> </ul>	
SET 2: BATHROOM SET	
<ul style="list-style-type: none"> <li>• 5 KNUCKLE FULL MORTISE HINGES</li> <li>• LEVER SET - PRIVACY FUNCTION</li> <li>• THRESHOLD</li> <li>• WALL STOP</li> <li>• SILENCERS</li> <li>• DOOR SWEEP</li> </ul>	

DOOR SCHEDULE										
ROOM #	DOOR TAG	DOOR TYPE	WIDTH	HEIGHT	THICKNESS	SIDE/LIGHT WIDTH	MATERIAL	FINISH	HARDWARE SET	COMMENTS
101	DO1	TYPE I	3'-0"	7'-0"	1-3/4"	-	WOOD	CLR.	Ø1	
102	DO2	TYPE I	3'-0"	7'-0"	1-3/4"	-	WOOD	CLR.	Ø2	
103	DO3	TYPE I	3'-0"	7'-0"	1-3/4"	-	WOOD	CLR.	Ø1	
104	DO4	TYPE I	3'-0"	7'-0"	1-3/4"	-	WOOD	CLR.	Ø1	
105	DO5	TYPE I	3'-0"	7'-0"	1-3/4"	-	WOOD	CLR.	Ø1	
ALL DOOR FRAME TO BE PAINTED PT-2 FINISH										

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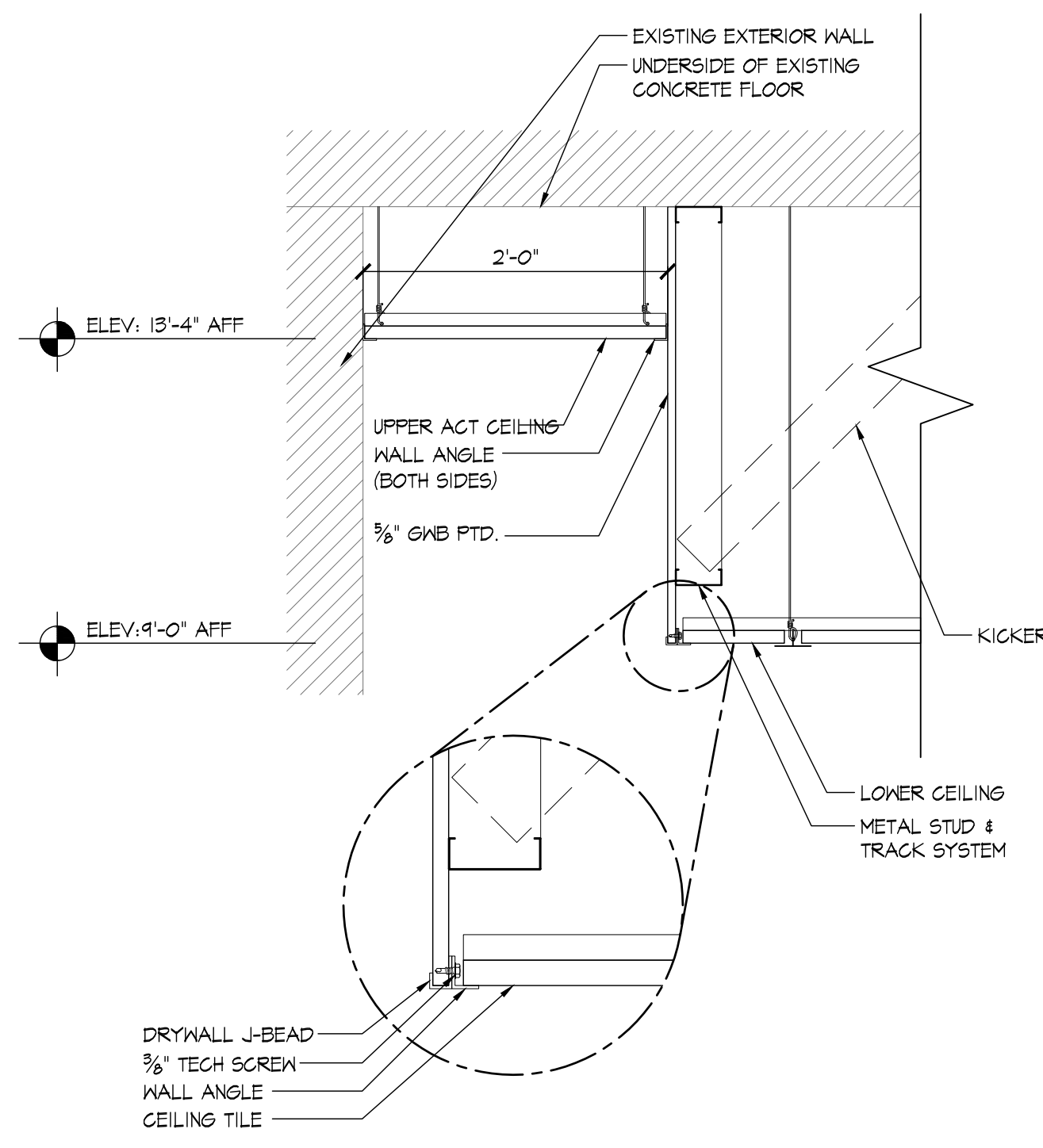
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Date 04-29-2022  
Drawn by CA/MP  
Reviewed by RJ  
Job No. 21-272

Drawing Name  
**DETAILS**

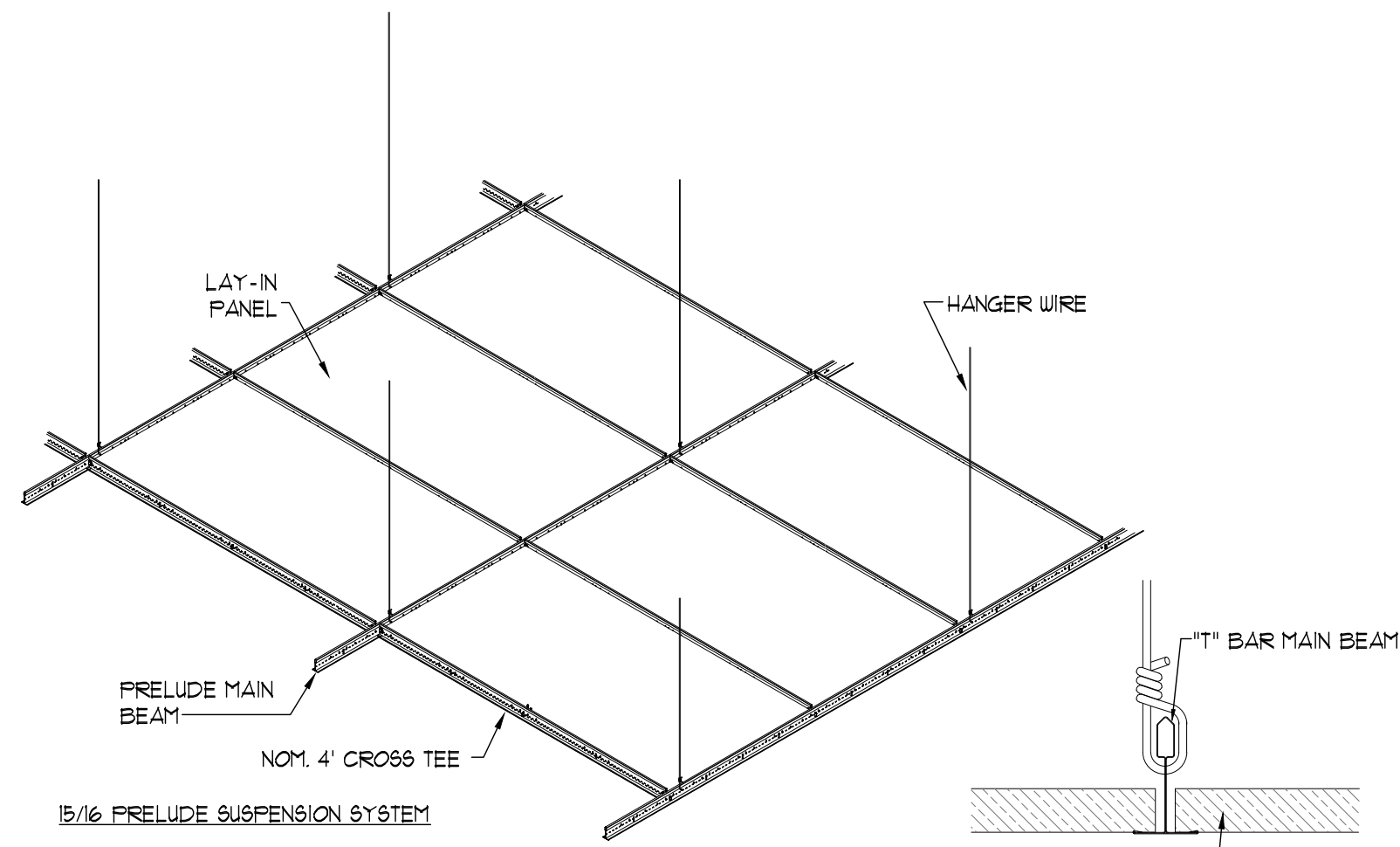
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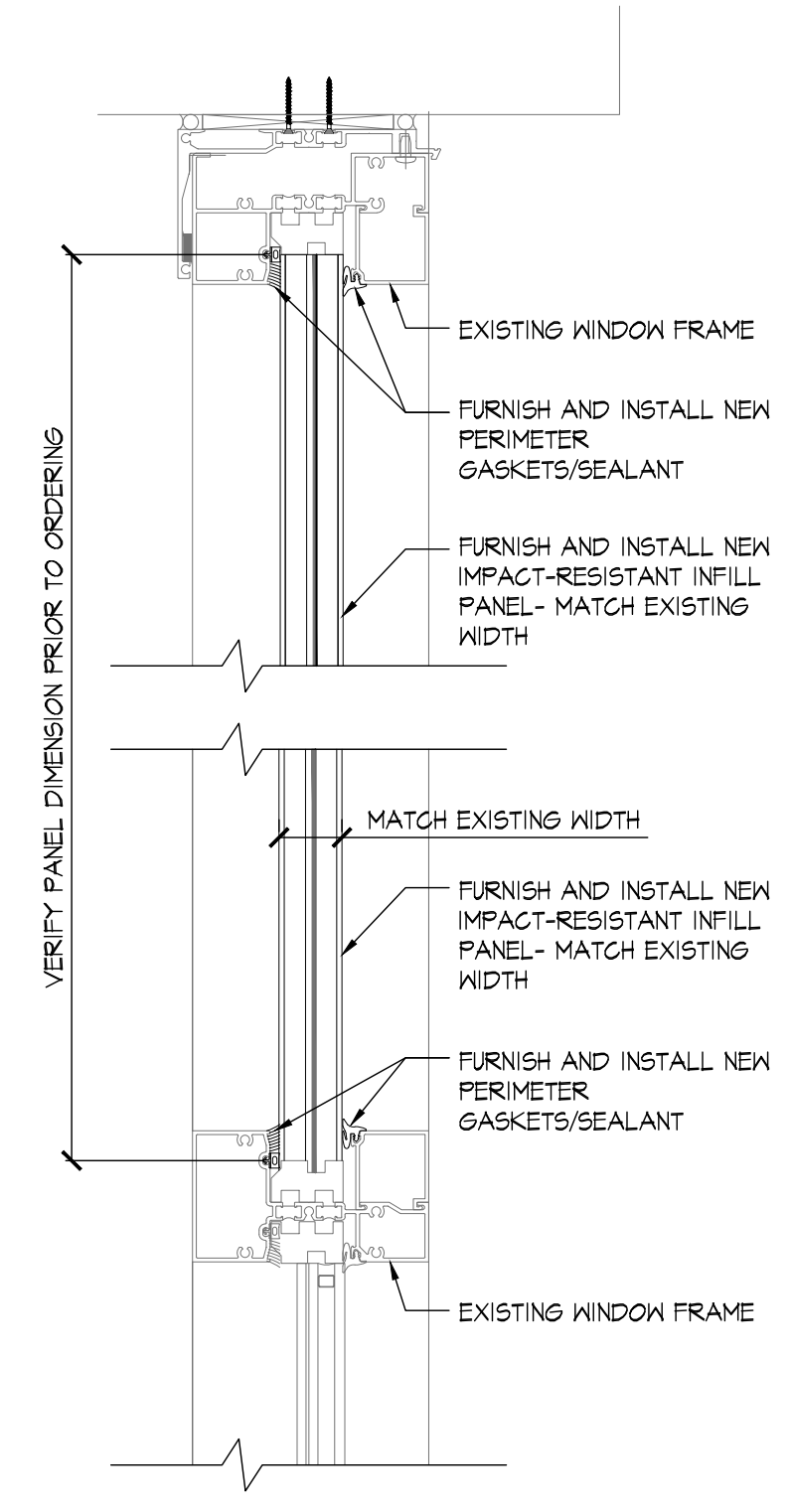
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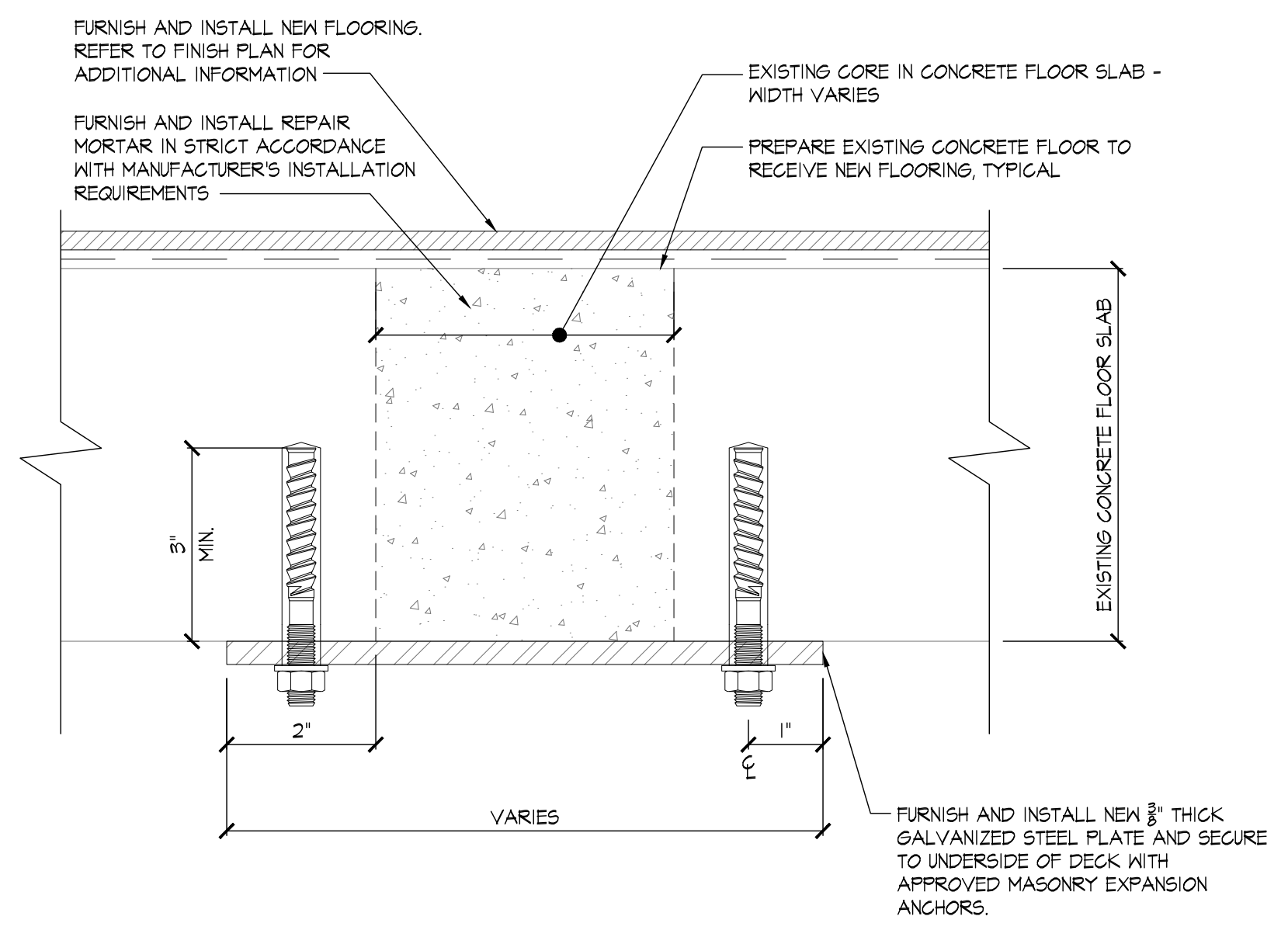
1 CEILING TRANSITION DETAIL  
SCALE: 1" = 1'-0"



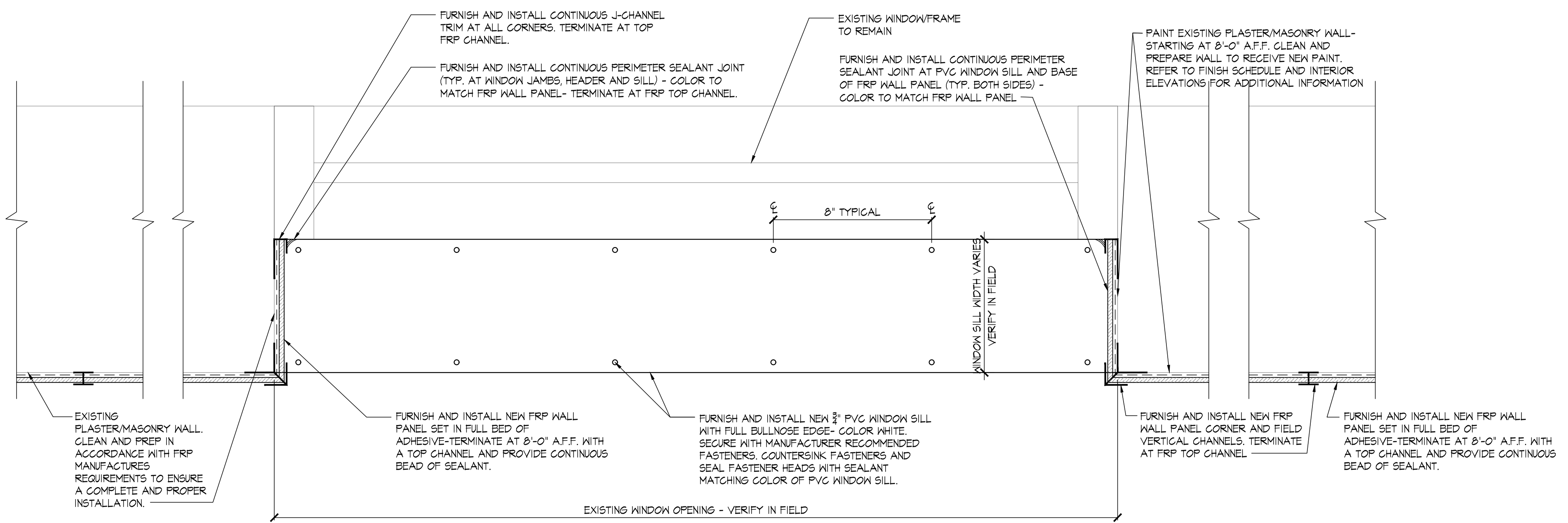
2 ARMSTRONG CEILING GRID DETAIL  
SCALE: 1/2" = 1'-0"



3 IMPACT RESISTANT PANEL DETAIL  
SCALE: 3" = 1'-0"



4 CONCRETE FLOOR SLAB REPAIR DETAIL  
SCALE: 6" = 1'-0"



5 PVC WINDOW SILL DETAIL  
SCALE: 3" = 1'-0"

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SCALE N.T.S.  
DATE 04-29-2022  
DRAWN BY DD  
REVIEWED BY TW  
JOB NO. 21-272

DRAWING NAME  
MECHANICAL LEGEND, NOTES AND ABBREVIATIONS

DRAWING NO.  
MO.0  
Issued for Bid

GENERAL NOTES

- 1. SCOPE OF WORK SHALL INCLUDE ALL LABOR, MATERIALS, TOOLS, EQUIPMENT, TRANSPORTATION, HOISTING, RIGGING, INSURANCE, REFRIGERANT, GLYCOL, ETC., TO PERFORM THE WORK AS INDICATED ON THE DRAWINGS AND HEREIN SPECIFIED FOR A COMPLETE AND FULLY OPERABLE INSTALLATION. ALL WORK SHALL BE IN ACCORDANCE WITH NATIONAL, STATE AND LOCAL CODES AND ORDINANCES HAVING JURISDICTION, AS INTERPRETED BY THE ARCHITECT/ENGINEER.
- 2. MECHANICAL EQUIPMENT AND SUCH OTHER APPARATUS AS MAY REQUIRE MAINTENANCE AND OPERATION FROM TIME TO TIME SHALL BE MADE EASILY ACCESSIBLE. ALTHOUGH THE EQUIPMENT MAY BE SHOWN ON THE DRAWINGS IN CERTAIN LOCATIONS, THE CONSTRUCTION MAY DISCLOSE THAT SUCH LOCATIONS DO NOT MAKE ITS POSITION READILY ACCESSIBLE. IN SUCH CASES, THE OWNER OR HIS REPRESENTATIVE SHALL BE NOTIFIED BEFORE ADVANCING THE CONSTRUCTION TO A STAGE WHERE A CHANGE WILL REFLECT ADDITIONAL EXPENSE.
- 3. THE DRAWINGS SHOW THE LAYOUT OF THE MECHANICAL SYSTEMS AND INDICATE THE APPROXIMATE LOCATIONS OF DUCTWORK, PIPING, BRANCHES AND ELBOWS, AND EQUIPMENT. THE RUNS AND QUANTITY OF DUCTWORK, PIPING, OFFSETS AND ELBOWS AS SHOWN ON THE DRAWINGS ARE DIAGRAMMATIC ONLY. THE EXACT ROUTING OF QUANTITY DUCTWORK, PIPING, OFFSETS AND ELBOWS SHALL BE DETERMINED BY THE STRUCTURAL CONDITIONS, POSSIBLE OBSTRUCTIONS AND COORDINATION DRAWINGS. THIS SHALL NOT BE CONSTRUED TO MEAN THAT THE DESIGN OF THE SYSTEMS MAY BE CHANGED, BUT REFERS ONLY TO EXACT ROUTING BETWEEN GIVEN POINTS.
- 4. IT SHALL BE THE RESPONSIBILITY OF THE HVAC CONTRACTOR TO STUDY ALL DRAWINGS AND DETAILS SO THAT THE INSTALLATION OF ALL NEW WORK CAN BE FULLY COORDINATED. COORDINATE WITH ALL TRADES TO AVOID INTERFERENCE BETWEEN THE HVAC INSTALLATION AND THE SYSTEMS AND EQUIPMENT OF OTHER TRADES.
- 5. HVAC WORK IS INDICATED DIAGRAMMATICALLY. EXACT LOCATION OF ALL COMPONENTS ARE TO BE DETERMINED IN THE FIELD AND BY THE ACTUAL BUILDING CONDITIONS. EQUIPMENT, DUCTS OR PIPES INTERFERING WITH OTHER INSTALLATIONS SHALL BE RELOCATED AS REQUIRED AT NO ADDITIONAL COST.
- 6. HVAC CONTRACTOR SHALL COORDINATE ALL WALL, CEILING, FLOOR, ROOF AND BEAM PENETRATIONS WITH ARCHITECT AND STRUCTURAL ENGINEER.
- 7. PRODUCTS REQUIRED BY CONSTRUCTION BUT NOT SPECIFICALLY DESCRIBED HEREIN SHALL BE AS SELECTED BY THE CONTRACTOR SUBJECT TO THE APPROVAL OF THE A/E.
- 8. PROVIDE AND INSTALL ALL MATERIALS, LABOR, EQUIPMENT, AND ACCESSORIES FOR COMPLETE AND OPERABLE SYSTEMS AND AS REQUIRED BY THE EQUIPMENT MANUFACTURER'S INSTALLATION INSTRUCTIONS AND AS INDICATED ON THE DRAWINGS.
- 9. INSTALLATION OF THE HVAC SYSTEM SHALL PERMIT ACCESSIBILITY FOR SERVICE AND/OR REPLACEMENT OF EQUIPMENT.
- 10. PROVIDE DUCT ACCESS DOORS FOR ALL MOTORIZED DAMPERS, AIR FLOW STATIONS, FIRE & SMOKE DAMPERS, DUCT SMOKE DETECTORS, THE ENTERING SIDE OF EVERY COIL, AND AT ALL OTHER LOCATIONS WHERE COMPONENTS ARE INSTALLED WITHIN DUCTWORK REGARDLESS OF WHETHER OR NOT AN ACCESS IS INDICATED ON THE FLOOR PLANS.
- 11. ALL MISCELLANEOUS STRUCTURAL SUPPORTS REQUIRED FOR HVAC EQUIPMENT/DUCTWORK INSTALLATION SHALL BE PROVIDED BY MECHANICAL CONTRACTOR WITH NO ADDITIONAL EXPENSE.
- 12. INSTALL ALL PIPING BELOW DUCTWORK UNLESS CLEARANCE CONDITION REQUIRES PIPING TO BE ABOVE.
- 13. WHERE DUCTWORK PENETRATES ANY SMOKE AND/OR FIRE RATED PARTITIONS PROVIDE UL LISTED DYNAMIC FIRE AND/OR SMOKE DAMPERS PER NFPA GUIDELINES. INSTALL DAMPER PER MANUFACTURER'S INSTRUCTIONS AND INSTALL DUCT AND ARCHITECTURAL ACCESS FOR EVERY DAMPER.
- 14. ALL CEILING MOUNTED EQUIPMENT SHALL BE INSTALLED IN SUCH A WAY THAT LIGHTS, PIPING, AND DUCTWORK DO NOT BLOCK ACCESS TO UNITS AND RELATED ACCESSORIES.
- 15. EXACT ELEVATION FOR SIDE WALL DIFFUSERS, REGISTERS AND GRILLES SHALL BE APPROVED BY THE ARCHITECT BEFORE INSTALLATION.
- 16. INSTALL ROOM THERMOSTATS OR SENSORS 48" (MAXIMUM) ABOVE FINISHED FLOOR OR AS OTHERWISE DIRECTED BY THE ARCHITECT.
- 17. THE MECHANICAL CONTRACTOR SHALL INCLUDE IN HIS BID AND SECURE THE SERVICES OF THE PROJECT ELECTRICAL CONTRACTOR FOR INCIDENTAL LINE VOLTAGE REQUIRED FOR AUTOMATIC TEMPERATURE CONTROLS.
- 18. ALL MOTORS SHALL BE PREMIUM EFFICIENCY. ALL MOTORS SPECIFIED FOR SERVICE WITH A VFD SHALL BE RATED FOR INVERTER DUTY AND SHALL INCLUDE MANUFACTURER'S INTEGRAL MOTOR SHAFT GROUNDING PROTECTION. FIELD INSTALLED RINGS ARE NOT ACCEPTABLE.
- 19. THE MECHANICAL CONTRACTOR MUST COORDINATE THE COMPONENTS AND PROGRAMMING OF THEIR EQUIPMENT VENDORS AND THEIR ATC SUBCONTRACTOR. CONTROL SEQUENCES SHALL BE TESTED AND CORRECTED TO THE SATISFACTION OF THE OWNER AND ENGINEER.
- 20. THE MECHANICAL CONTRACTOR MUST INCLUDE COMPLETE TESTING, ADJUSTING AND BALANCING OF EVERY COMPONENT. ENTERING WATER TEMPERATURE, LEAVING WATER TEMPERATURE, GPM AND PRESSURE DROP READINGS ARE REQUIRED AT EVERY COIL AND COMPONENT; ABSOLUTELY NO AUTOMATIC BALANCING VALVES WILL BE ALLOWED. EVERY AIR SYSTEM MUST BE TESTED, ADJUSTED AND BALANCED. ENTERING AIR TEMPERATURE, LEAVING AIR TEMPERATURE, AND APD THROUGH EACH COIL IS REQUIRED WITH CORRESPONDING WATER-SIDE INFORMATION. CFM FLOW WILL BE MEASURED AND CHECKED AGAINST AIR-FLOW STATION READING TO CALIBRATE AIR FLOW STATIONS. CFM AIRFLOW AND PRESSURE MUST BE MEASURED IN MAIN AND BRANCH DUCTS, DIFFUSER AND REGISTER AIRFLOW SHALL BE MEASURED AT EACH DEVICE AND ADJUSTMENTS MADE. INITIAL, ADJUSTED AND FINAL READINGS SHALL BE RECORDED. CONDITIONS AT TIME OF TESTING MUST INCLUDE OUTDOOR AIR TEMPERATURE, MODE OF SYSTEM, CONDITION OF FILTERS, CONDITION OF EQUIPMENT, AND ANY OTHER RELEVANT INFORMATION. DOCUMENT ALL PROBLEMS FOUND OR CONDITIONS WHICH IMPACT RESULTS OF BALANCING. RECORD ALL MOTOR POWER DATA AND FAN RPMs. MARK ALL BALANCED SETTINGS IN PERMANENT INK ON THE VALVE, VOLUME DAMPER, OR SPEED DIAL.

GENERAL DEMOLITION NOTES

- 1. GENERAL DEMOLITION NOTES SHALL APPLY TO ALL MECHANICAL DRAWINGS.
- 2. VISIT THE SITE AND EXAMINE CAREFULLY THE EXISTING CONDITIONS TO BECOME FAMILIAR WITH THEM AND DIFFICULTIES THAT WILL AFFECT TO EXECUTION OF THE WORK PRIOR TO THE SUBMISSION OF A PROPOSAL.
- 3. SUBMISSION OF A PROPOSAL WILL BE CONSTRUED AS EVIDENCE THAT SUCH AN EXAMINATION HAS BEEN MADE AND LATER CLAIMS WILL NOT BE RECOGNIZED FOR EXTRA LABOR, EQUIPMENT OR MATERIALS REQUIRED BECAUSE OF DIFFICULTIES ENCOUNTERED WHICH COULD HAVE BEEN FORESEEN SUCH AN EXAMINATION HAS BEEN MADE.
- 4. NOTES AND GRAPHIC REPRESENTATION SHALL NOT LIMIT THE EXTENT OF DEMOLITION REQUIRED.
- 5. EQUIPMENT AND DEVICES TO BE REMOVED SHALL BE DISCONNECTED PRIOR TO ANY DEMOLITION WORK. EQUIPMENT INDICATED TO BE REMOVED SHALL BE TAKEN FROM THE SITE AND DISPOSED OF IN ACCORDANCE WITH APPLICABLE LAWS AND ENVIRONMENTAL REGULATIONS, UNLESS OTHERWISE NOTED.
- 6. EQUIPMENT REQUIRED TO BE TURNED OVER TO THE OWNER OR REUSED SHALL BE PLACED IN A MUTUALLY ACCEPTABLE LOCATION.
- 7. FIELD VERIFY EXISTING DUCTWORK CONFIGURATION LOCATION PRIOR TO REMOVAL.
- 8. PATCH, REPAIR AND PAINT ALL WALLS, CEILINGS AND MASONRY EFFECTED BY NEW WORK, DEMOLITION, RELOCATED EQUIPMENT, DUCTWORK, PATCHING AND REPAIR WORK SHALL MATCH EXISTING.

ABBREVIATIONS

ALL ABBREVIATIONS SHOWN ARE NOT NECESSARILY USED ON THIS PROJECT

AC	AIR CONDITIONING UNIT	HVAC	HEATING, VENTILATION, AND AIR CONDITIONING
AD	ACCESS DOOR	HV	HEATING & VENTILATING UNIT
AFF	ABOVE FINISHED FLOOR	HHE	HEATING WATER HEAT EXCHANGER
AF	AIR FILTER	HE	HEAT EXCHANGER
AHU	AIR HANDLING UNIT	HWP	HOT WATER PUMP
AP	ACCESS PANEL	HW	HOT WATER
APD	AIR PNEUMATIC DROP	HWR	HOT WATER RETURN
ARCH	ARCHITECT	HWS	HOT WATER SUPPLY
ATC	AUTOMATIC TEMPERATURE CONTROL	HZ	HERTZ
AS	AIR SEPARATOR	IN	INCHES
AV	AIR VENT	IRV	INTAKE ROOF VENT
BB	BASEBOARD	KEF	KITCHEN EXHAUST FAN
BD	BAROMETRIC DAMPER(COUNTER BALANCED)	KW	KILOWATT
BDD	BACKDRAFT DAMPER	LAT	LEAVING AIR TEMPERATURE
BHP	BRAKE HORSEPOWER	LD	LINEAR DIFFUSER
BMS	BUILDING MANAGEMENT SYSTEM (DDC)	LF	LINEAR FEET
BLDG	BUILDING	LPH	LOUVERED PENTHOUSE
BOD	BOTTOM OF DUCT	LPS	LOW PRESSURE STEAM
BTU	BRITISH THERMAL UNITS	LRA	LOCKED ROTOR AMPS
BTUH	BTU PER HOUR	LWT	LEAVING WATER TEMPERATURE
BV	BALL VALVE	MAU	MAKE-UP AIR UNIT
B	BOILER	MAX	MAXIMUM
CB	CHILLER BOILER	MBH	THOUSANDS OF BTU'S PER HOUR
CC	COOLING COIL	MCA	MINIMUM CIRCUIT AMPS
CD	CONDENSATE DRAIN	MD	MOTORIZED DAMPER
CEF	CEILING EXHAUST FAN	MECH	MECHANICAL
CFM	CUBIC FEET PER MINUTE	MIN	MINIMUM
CH	CEILING HEATER	MOC	MAXIMUM OVER CURRENT PROTECTION
CH	CHILLER	MTD	MOUNTED
CHW	CHILLED WATER	N/A	NOT APPLICABLE
CHWR	CHILLED WATER RETURN	NC	NORMALLY CLOSED
CHWS	CHILLED WATER SUPPLY	NEZV	NON-ELECTRIC ZONE VALVE
CP	CONDENSATE PUMP	NIC	NOT IN CONTRACT
CP	CONTROL PANEL	NO	NORMALLY OPEN
CO	CLEAN OUT	NTS	NOT TO SCALE
CO2	CARBON DIOXIDE	OA	OUTSIDE AIR
COP	CENTER OF PIPE	OAT	OUTSIDE AIR TEMPERATURE
CR	CONDENSATE RECEIVER	OPD	OPPOSED BLADE DAMPER
CRP	CONDENSATE RETURN PUMP	OD	OUTSIDE DIAMETER
CT	COOLING TOWER	P	PUMP
CUH	CABINET UNIT HEATER	PD	PRESSURE DROP
CWTP	COOLING TOWER WATER PUMP	PSI	POUNDS PER SQUARE INCH GA.
CWP	CHILLED WATER PUMP	PR	PANEL RADIATOR
CWS	CONDENSING WATER SUPPLY	PRV	PRESSURE REDUCING VALVE
CWR	CONDENSING WATER RETURN	PTAC	PACKAGED TERMINAL AIR CONDITIONER
CWV	CONNECTOR	R	RETURN AIR
CU	CONDENSING UNIT	RA	ROOF EXHAUST FAN
DDC	DIRECT DIGITAL CONTROL	REQ'D.	REQUIRED
DB	DRY BULB	RG	RETURN GRILLE
DIA	DIAMETER	RH	RELATIVE HUMIDITY
DIFF	DIFFUSER	RH	REHEAT COIL
DN	DOWN	RLA	RATED LOAD AMPS
DX	DIRECT EXPANSION	RM	ROOM
DWG	DRAWING	RPM	REVOLUTIONS PER MINUTE
DWE	DOMESTIC WATER HEATER EXCHANGER	RTU	ROOF TOP UNIT
E	EXISTING	RVD	REMOTE CONTROLLED VOLUME DAMPER
EAT	ENTERING AIR TEMPERATURE	S	SUPPLY
EBB	ELECTRIC BASEBOARD	SA	SUPPLY AIR
EFF	EFFICIENCY	SA	SOUND ATTENUATOR
EH	EXHAUST FAN	SAT	SUPPLY AIR TEMPERATURE
EH	ELECTRIC HUMIDIFIER	SCT	SATURATED CONDENSING TEMPERATURE
ELEC	ELECTRICAL	SD	SMOKE DAMPER
ELV	ELEVATION	SF	SQUARE FEET
ERV	ENERGY RECOVERY UNIT	SH	STEAM HUMIDIFIER
ESP	EXTERNAL STATIC PRESSURE	SFD	SMOKE/FIRE DAMPER
ET	EXPANSION TANK	SP	STATIC PRESSURE
ETR	EXISTING TO REMAIN	SQ	SQUARE
EUH	ELECTRIC UNIT HEATER	SST	SATURATED SUCTION TEMPERATURE
EWI	ENTERING WATER TEMPERATURE	STL	STEEL
EXH	EXHAUST	T	THERMOSTAT
EXP	EXPANSION	T.B.D.	TO BE DEMOLISHED
*F	DEGREES FAHRENHEIT	TU	TERMINAL UNIT
FA	FRESH AIR	TYP.	TYPICAL
FA	FREE AREA	UH	UNDERCUT DOOR 3/4" (MIN.) UNIT HEATER
FBT	FLAT BOTTOM TRANSITION	UV	UNIT VENTILATOR
FCU	FAN COIL UNIT	UV	VARIABLE AIR VOLUME
FD	FIRE DAMPER	VD	VOLUME DAMPER
FLA	FULL LOAD AMPS	VFD	VARIABLE FREQUENCY DRIVE
FLEX	FLEXIBLE	W/	WITH
FMS	FLOW MEASURING STATION	W/O	WITHOUT
FPI	FINS PER INCH	WB	WET BULB TEMPERATURE
FPM	FEET PER MINUTE	WG	WATER GAUGE
FOS	FUEL OIL SUPPLY	WMS	WIRE MESH SCREEN
FOR	FUEL OIL RETURN	ZV	ZONE VALVE
FTR	FINNED TUBE RADIATION	WH	WATER HEATER
FT	FEET		
GAL	GALLONS		
GALV	GALVANIZED		
GC	GENERAL CONTRACTOR		
GPM	GALLONS PER MINUTE		
GV	GATE VALVE		
HC	HEATING COIL		
HP	HEAT PUMP		
HP	HORSEPOWER		

SHEET LIST

SHEET NUMBER	SHEET NAME
MO.0	MECHANICAL LEGEND, NOTES AND ABBREVIATIONS
M1.0	MECHANICAL DEMOLITION AND NEW WORK PLANS
M4.0	MECHANICAL SCHEDULES
M5.0	MECHANICAL DETAILS

PIPING LEGEND

---	L---	LIQUID REFRIGERANT LINES
---	S---	SUCTION REFRIGERANT LINES
---	CD---	CONDENSATION DRAIN
---	---	PIPE TURNING DOWN
---	---	PIPE TURNING UP
---	---	TEE OFF TOP
---	---	TEE OFF BOTTOM
---	---	DROP AND RUN
---	---	DROP AND TURN
---	---	TEE UP
---	---	TEE DOWN
---	---	VALVE IN RISER
---	---	PIPE CAP
---	---	CLEAN-OUT
---	---	UNION (DIELECTRIC TYPE ON DISSIMILAR METALS)
---	---	FLANGED (DIELECTRIC TYPE ON DISSIMILAR METALS)
---	---	BALL VALVE
---	---	GATE VALVE
---	---	GATE VALVE
---	---	BUTTERFLY VALVE
---	---	GLOBE VALVE
---	---	DIAPHRAGM VALVE
---	---	OS-Y GATE VALVE
---	---	4-WAY VALVE
---	---	CHECK VALVE (SWING TYPE)
---	---	CHECK VALVE w/ BALL DRIP
---	---	PRESSURE REDUCING VALVE
---	---	PLUG VALVE
---	---	CIRCUIT SETTER w/ GAGE PORT
---	---	MULTI PURPOSE VALVE
---	---	AUTOMATIC BALANCING VALVE
---	---	MANUAL BALANCING VALVE
---	---	PUMP
---	---	STRAINER w/ BLOW DOWN (INLINE)
---	---	PIPE DRAIN w/ BALL VALVE & CAP
---	---	EPDM FLEXIBLE CONNECTION
---	---	EPDM FLEXIBLE CONNECTION
---	---	PITCH UP/DN. IN DIRECTION OF FLOW
---	---	F&T STEAM TRAP
---	---	ANCHOR
---	---	PIPE GUIDE
---	---	WALL SLEEVE
---	---	FLOW SWITCH
---	---	FLOW RATE METER (IN GPM)
---	---	FLOW SENSOR
---	---	TEMPERATURE SENSOR
---	---	SAFETY RELIEF VALVE PIPE TO FLOOR DRAIN
---	---	MANUAL NON-RISING
---	---	MANUAL LEVER
---	---	QUICK OPEN LEVER
---	---	PNEUMATIC ACTUATOR
---	---	ELECTRIC ACTUATOR
---	---	ELECTRIC ACTUATOR
---	---	THERMOMETER w/ STOP
---	---	PRESSURE GAGE w/ STOP
---	---	AUTO. AIR VENT

DUCTWORK LEGEND

---	---	ROUND ELBOWS 45° LONG RADIUS
---	---	ROUND ELBOWS 45° SHORT RADIUS
---	---	ROUND DUCT DROP
---	---	ROUND DUCT RISER
---	---	TAKE-OFF w/ BRANCH DAMPER (REFER TO DETAIL FOR TAKE-OFF TYPE)
---	---	BULLHEAD SPLIT SUPPLY
---	---	BULLHEAD CONVERGE RETURN/EXHAUST
---	---	HORIZONTAL OFFSET
---	---	FLEXIBLE CONNECTION (6" NEOPRENE)
---	---	LINED DUCT - SIZE INDICATES INSIDE DIMENSION
---	---	RECTANGULAR DUCT - FIRST FIGURE IS SIDE SHOWN
---	---	SPIRAL DUCTWORK
---	---	FLEXIBLE DUCTWORK
---	---	DUCT HUMIDIFIER
---	---	DUCT FILTER BOX
---	---	VOLUME DAMPER (OPPOSED BLADE TYPE)
---	---	MOTORIZED CONTROL DAMPER
---	---	BACK DRAFT DAMPER
---	---	DYNAMIC FIRE DAMPER HORIZONTAL
---	---	DYNAMIC FIRE DAMPER VERTICAL
---	---	OUTSIDE AIR MEASUREMENT STATION
---	---	DUCT CAP
---	---	WELDED DUCT
---	---	EXISTING DUCT TO REMAIN (SHOWN LIGHT)
---	---	EXISTING DUCT TO BE REMOVED (SHOWN DARK)
---	---	ACCESS PANEL ON BOTTOM OF DUCT
---	---	ACCESS PANEL ON SIDE OF DUCT
---	---	TRANSITION - ECCENTRIC
---	---	TRANSITION - CONCENTRIC
---	---	RECTANGULAR TO ROUND TRANSITION
---	---	EXHAUST/RETURN/INTAKE FLOW ARROW
---	---	SUPPLY AIR FLOW DIRECTION

GENERAL LEGEND

---	---	EQUIPMENT TO BE REMOVED
---	---	EXTENT OF DEMOLITION TO EXISTING.
---	---	POINT TO CONNECT NEW TO EXISTING. VERIFY SIZE AND LOCATION IN FIELD PRIOR TO INSTALLATION
---	---	SWITCH
---	---	TEMPERATURE SENSOR
---	---	WALL THERMOSTAT
---	---	WALL MOUNTED HUMIDISTAT
---	---	COOLING THERMOSTAT (REVERSE ACTING)
---	---	HEATING/COOLING THERMOSTAT
---	---	THERMOSTAT GUARD w/ KEY LOCK BY HONEYWELL MODEL VERSAGAURD
---	---	DUCT MOUNTED STATIC PRESSURE SENSOR
---	---	DUCT MOUNTED SMOKE DETECTOR
---	---	DUCT MOUNTED HUMIDITY SENSOR
---	---	DUCT MOUNTED TEMPERATURE SENSOR
---	---	DUCT MOUNTED DEW POINT SENSOR

DUCTWORK LEGEND

---	---	SUPPLY CEILING DIFFUSER THROW PATTERN
---	---	RETURN/EXHAUST CEILING REGISTER
---	---	CEILING EXHAUST FAN WITH FLEXIBLE CONNECTION
---	---	SIDE WALL GRILLE/REGISTER
---	---	LINEAR DIFFUSER
---	---	FLOOR GRILLE/REGISTER
---	---	SUPPLY DUCT UP
---	---	SUPPLY DUCT DOWN
---	---	RETURN/EXHAUST DUCT UP
---	---	RETURN/EXHAUST DUCT DN.
---	---	MITERED ELBOWS 90° w/ VANES
---	---	MITERED ELBOWS 45° w/ VANES
---	---	30° 2 PIECE CUT ELBOW
---	---	CUT ELBOW 45° 3 PIECE
---	---	CUT ELBOW 60° 3 PIECE
---	---	CUT ELBOW 90° 3 PIECE
---	---	CUT ELBOW 90° 5 PIECE
---	---	ROUND ELBOWS 90° LONG RADIUS (R/D=1.5)
---	---	ROUND ELBOWS 90° SHORT RADIUS (R/D=1.25)

May 17, 2022 - 10:34am - Schneider - J:\2022\0220008 Pawtucket Fire Department - Rhode Island\01 - Cad\02-MECH\MO.0-MECHANICAL LEGEND.dwg

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### GENERAL SHEET NOTES

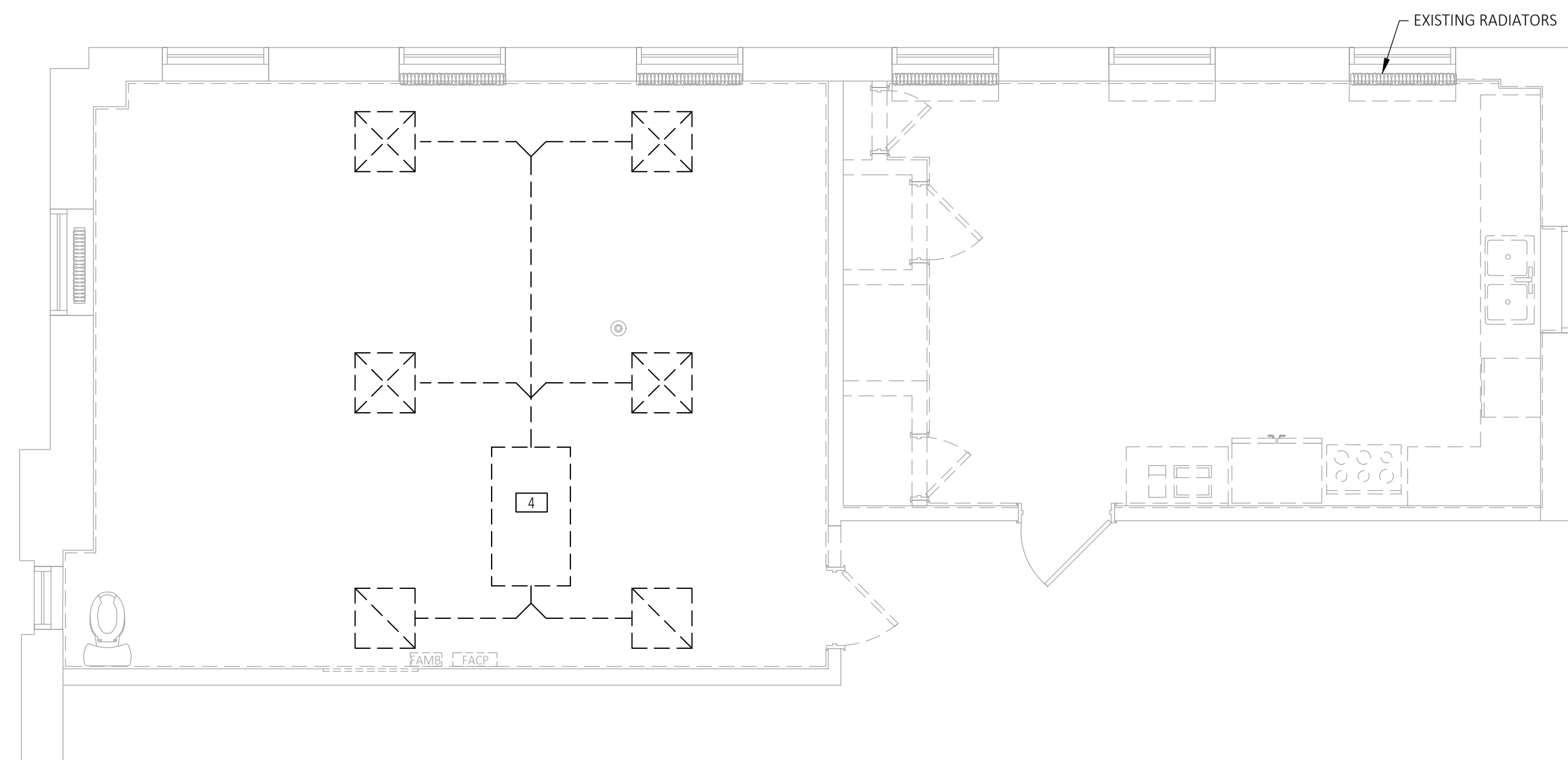
1. RADIATORS ALONG PERIMETER EXTERIOR WALL ARE EXISTING TO REMAIN.

### KEYED SHEET NOTES

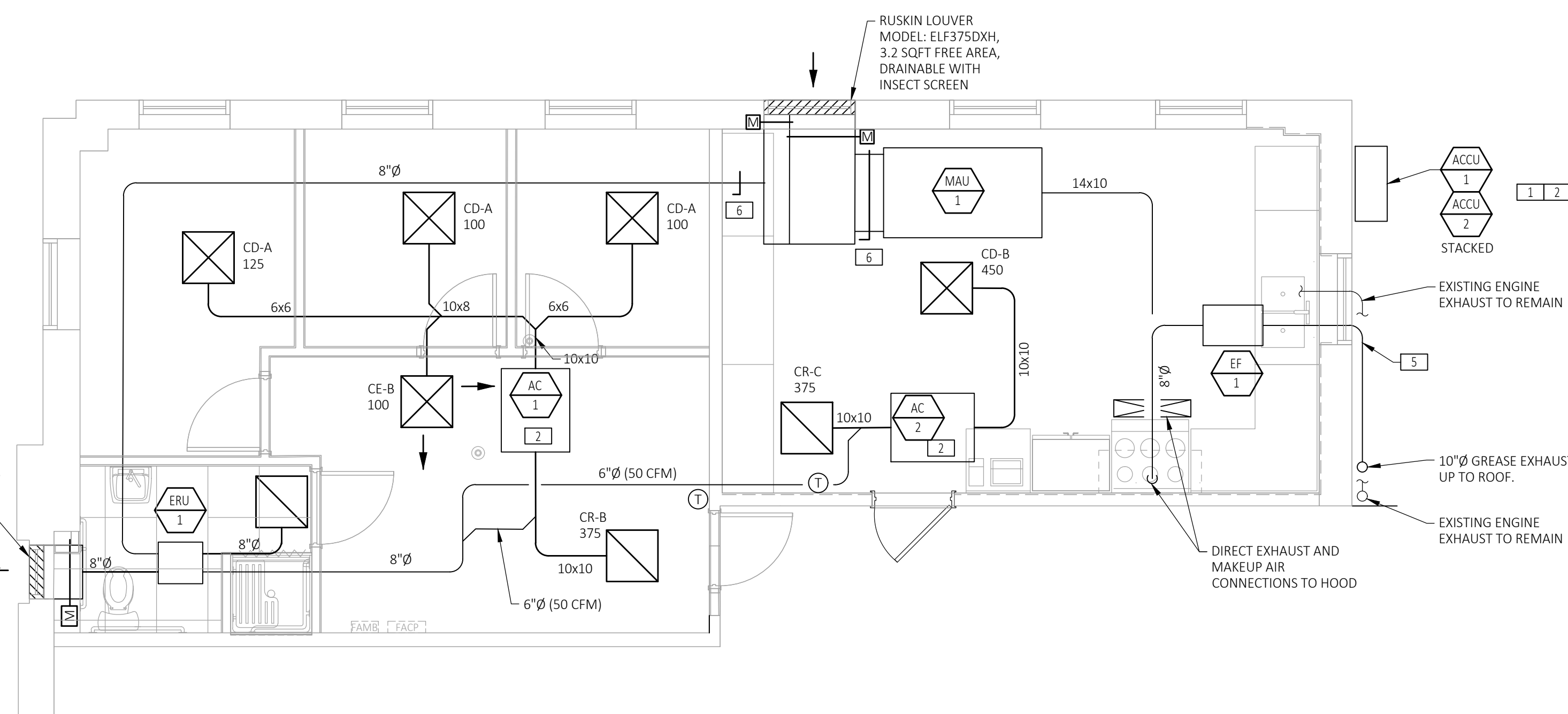
1. OUTDOOR CONDENSING UNITS SHALL BE INSTALLED AND SECURED TO THE EXTERIOR OF THE BUILDING. EXACT LOCATION SHALL BE FIELD VERIFIED AND COORDINATED WITH BUILDING OWNER AND ARCHITECT. REFER TO DETAILS.
2. REFRIGERANT PIPING ROUTING FROM AIR COOLED CONDENSING UNIT (ACCU) TO AIR CONDITIONING (AC) TO BE FIELD CONFIRMED. PIPE SIZING AND ROUTING TO BE PER MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS AND RECOMMENDATIONS. RUN CONDENSATE TO NEAREST DRAIN, COORDINATE WITH OWNER.
3. NOT USED
4. REMOVE AIR HANDLING UNIT IN ITS ENTIRETY INCLUDING CONDENSING UNIT. ALL ASSOCIATED DUCTWORK, PIPING, DIFFUSERS, HANGERS, CONTROLS, WIRING AND APPURTENANCES.
5. OUTDOOR GREASE DUCT TO BE DOUBLE-WALLED STAINLESS STEEL, COORDINATE WITH VENDOR FOR OUTDOOR RATING.
6. MANUAL LOCKABLE VOLUME DAMPER

### LOCAL CONTROLS & SEQUENCES

- A. AC-X, WITH ACCU-X:
1. THE UNIT SHALL OPERATE FROM THE MANUFACTURER'S WALL-MOUNTED PROGRAMMABLE THERMOSTAT & MANUFACTURER FURNISHED SEQUENCES, WITH ACCESSORY LOCKABLE COVER WHERE NEEDED IN PUBLIC SPACES.
  2. OCCUPIED/UNOCCUPIED SCHEDULE SHALL BE PROGRAMMED BY THIS CONTRACTOR AT THE DIRECTION OF THE OWNER.
  3. ROOM COOLING SETPOINT: 75°F (ADJ); HEATING SETPOINT: 70°F (ADJ).
- B. GREASE EXHAUST FAN (EF-X):
1. THE GREASE HOOD EXHAUST FAN SHALL BE CONTROLLED VIA WALL SWITCH LOCATED IN THE KITCHEN NEAR (VERIFY LOCATION WITH OWNER). THE OPERATION OF THE KITCHEN MAKEUP AIR UNIT SHALL BE INTERLOCK WITH THE OPERATION OF THE GREASE EXHAUST FAN (REFER TO MAKEUP SEQUENCE BELOW).
- C. MAKEUP AIR UNIT (MAU-X):
1. THE MAKEUP UNIT SHALL BE ENERGIZED WHEN THE GREASE EXHAUST FAN IS ENERGIZED AND INTAKE LOUVER DAMPER IS PROVEN OPEN VIA END SWITCH.
  2. THE MAKEUP AIR UNIT SHALL BE DE-ENERGIZED WHEN THE GREASE EXHAUST FAN IS DE-ENERGIZED.
- D. ENERGY RECOVERY UNIT (ERU-X):
1. UNIT SHALL BE ENERGIZED AND CONTROLLED BY A BLDG PROGRAMMABLE TIMER FURNISHED AND INSTALLED BY THE ELECTRICAL CONTRACTOR UNDER AN OCCUPIED / UNOCCUPIED SCHEDULE. INTAKE LOUVER DAMPER SHALL BE PROVEN OPEN VIA END SWITCH PRIOR TO UNIT STARTING.
  2. THE UNIT SHALL RUN CONSTANTLY DURING OCCUPIED HOURS. UNIT SHALL BE DE-ENERGIZED DURING UNOCCUPIED HOURS.



1 DEMOLITION WORK FLOOR PLAN  
SCALE: 1/4" = 1'-0"



2 NEW WORK FLOOR PLAN  
SCALE: 1/4" = 1'-0"

## PAWTUCKET CITY HALL FIRE DEPARTMENT RESCUE ROOM & KITCHEN RENOVATIONS

137 ROOSEVELT AVENUE  
PAWTUCKET, RI 02860

SCALE 1/4" = 1'-0"  
DATE 04-29-2022  
DRAWN BY DD  
REVIEWED BY TW  
JOB NO. 21-272

DRAWING NAME  
**MECHANICAL DEMOLITION AND NEW WORK PLANS**

DRAWING NO.

# M1.0

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### MAU SCHEDULE

TAG NO.	LOCATION	AREA SERVED	B.H.P.	TOTAL CFM	MIN OA CFM	SUPPLY FAN DATA			DX COOLING COIL DATA								ELECTRIC HEATING DATA					ELECTRICAL FAN DATA					WEIGHT (LBS)	MANUFACTURER MODEL NUMBER	REMARKS				
						ESP (IN WC)	MOTOR HP	FAN RPM	NOMINAL COOLING (TONS)	REFRIG TYPE	TOTAL MBH	SENSIBLE MBH	EAT. DB *F	EAT. WB *F	LAT. DB *F	LAT. WB *F	# OF COMPRESSORS	INPUT (KW)	CONTROL	EAT (*F)	LAT (*F)	VOLT	PH	HZ	SONES	VOLT				PH	HZ	MOCP	MCA
MAU-1	KITCHEN CEILING	KITCHEN	1.41	700	700	1.0	1.1	2,180	2	R-410A	28.4	21.79	91.0	73.0	62.07	61.07	1	15.8	SCR	8.5	79.8	208	3	60	54.1	208	3	60	60	58	606	AAON H3	1

REMARKS:  
1. DISCONNECT PROVIDED BY DIV. 26.

### SPLIT SYSTEM EVAPORATING UNIT SCHEDULE (INDOOR UNIT)

TAG NO.	AREA SERVED	UNITS SERVED	COOLING CAPACITY (BTU/H)	HEATING CAPACITY (BTU/H)	MIN SUCTION LINE (IN. OD)	MIN LIQUID LINE (IN. OD)	AIRFLOW (CFM) LO/HI	ELETRICAL DATA					WEIGHT (LBS)	MANUFACTURER MODEL NUMBER	REMARKS
								VOLT	PH	HZ	MOCP	MCA			
AC-1	SEE PLANS	ACCU-2	15,000	-	1/2	1/4	360/515	208	1	60	15	9.7	62	mitsubishi	1,2,3,4,5
AC-2	SEE PLANS	ACCU-2	15,000	-	1/2	1/4	360/515	208	1	60	15	9.7	62	mitsubishi	1,2,3,4,5

REMARKS:  
1. COORDINATE POWER AND DISCONNECT REQUIREMENTS WITH ELECTRICIAN.  
2. R410A REFRIGERANT  
3. PROVIDE WITH MANUFACTURER'S ACCESSORY CONDENSATE PUMP TO BE INSTALLED IN FIELD.  
4. SIZE REFRIGERANT PIPING PER MANUFACTURER'S REQUIREMENTS.  
5. PROVIDE WITH WIRED REMOTE CONTROL THERMOSTAT.  
6. PROVIDE FILTER RACK WITH MERV 8 FILTERS

### SPLIT SYSTEM CONDENSING UNIT SCHEDULE (OUTDOOR UNIT)

TAG NO.	UNITS SERVED	COOLING CAPACITY (BTU/H)	HEATING CAPACITY (BTU/H)	MIN SUCTION LINE (IN. OD)	MIN LIQUID LINE (IN. OD)	SONES	EER	ELETRICAL DATA					WEIGHT (LBS)	MANUFACTURER MODEL NUMBER	REMARKS
								VOLT	PH	HZ	MOCP	MCA			
ACCU-1	MAU-1	30,000	-	7/8	1/2	-	17.4	208	3	60	15	11	516.0	AAON	1,2,3,4
ACCU-2	AC-1,AC-2	30,000	-	7/8	1/2	-	19.1	208	1	60	15	9.7	151	MITSUBISHI	1,2,3,4

REMARKS:  
1. LOW-AMBIENT ACCESSORIES FOR COOLING DOWN TO -4°F.  
2. R410A REFRIGERANT  
3. PROVIDE EXTERIOR WALL BRACKET, INSTALLED PER MFG INSTRUCTIONS  
4. POWER WIRING AND INTERCONNECTING WIRING SHALL BE INSTALLED PER MFG INSTRUCTIONS.

### FAN SCHEDULE

TAG NO.	SERVICE	FAN TYPE	ESP (IN WC)	CFM	DRIVE	ECM	BHP	MOTOR HP	ELECTRICAL DATA			MANUFACTURER MODEL NUMBER	REMARKS
									V	PH	HZ		
EF-1	KITCHEN	INLINE	1.5	750	DIRECT	YES	0.415	1/2	115	1	60	THERMOTEK	1, 2

NOTES:  
1. DISCONNECT PROVIDED BY DIV. 26.  
2. PURCHASE WITH GREASE RATED ACCESSORIES.

### AIR INLETS AND OUTLETS

DESIGNATION	CFM RANGE	TYPE OF SERVICE	NECK SIZE (IN)	MOUNTING	NC AT MAX CFM	MAX PD (IN)	MANUF. MODEL NUMBER	REMARKS
CD-A	80-125	SUPPLY	6x6	LAY-IN	25	0.1	TITUS TDV	①②
CD-B	251-450	SUPPLY	12x12	LAY-IN	25	0.1	TITUS TDV	①②
CR-A/CE-A	50-200	RETURN/EXHAUST	8x8	LAY-IN	25	0.1	TITUS 350RL	①②
CR-B/CE-B	205-375	RETURN/EXHAUST	12x12	LAY-IN	25	0.1	TITUS 350RL	①②
CR-C/CE-C	451-800	RETURN/EXHAUST	16x16	LAY-IN	25	0.1	TITUS 350RL	①②

NOTES:  
1. COORDINATE FINISH, MOUNTING AND COLORS WITH ARCHITECT.  
2. GRILLES SHALL BE 3/4" SPACING BLADES PARALLEL TO LONG DIMENSION 35 DEGREE DEFLECTION.

### ENERGY RECOVERY UNIT SCHEDULE

TAG NO.	SUPPLY CFM	EXHAUST CFM	OA CFM	ESP (IN WC)	DESIGN CONDITION DATA			TOTAL EFF %		ELETRICAL DATA					WEIGHT (LBS)	MANUFACTURER MODEL NUMBER	REMARKS
					SUMMER (DB *F)	SUMMER (WB *F)	WINTER (DB *F)	SUMMER	WINTER	VOLT	PH	HZ	MOCP	MCA			
ERU-1	100	100	100	0.6	91	73	8.5	74.5	81.7	120	1	60	15	10	57	METRO 120	-

REMARKS:  
1. COORDINATE ELECTRICAL REQUIREMENTS WITH THE ELECTRICAL CONTRACTOR.

## PAWTUCKET CITY HALL

FIRE DEPARTMENT RESCUE ROOM & KITCHEN RENOVATIONS

137 ROOSEVELT AVENUE  
PAWTUCKET, RI 02860

SCALE N.T.S.  
DATE 04-29-2022  
DRAWN BY DD  
REVIEWED BY TW  
JOB NO. 21-272

DRAWING NAME  
**MECHANICAL SCHEDULES**

DRAWING NO.

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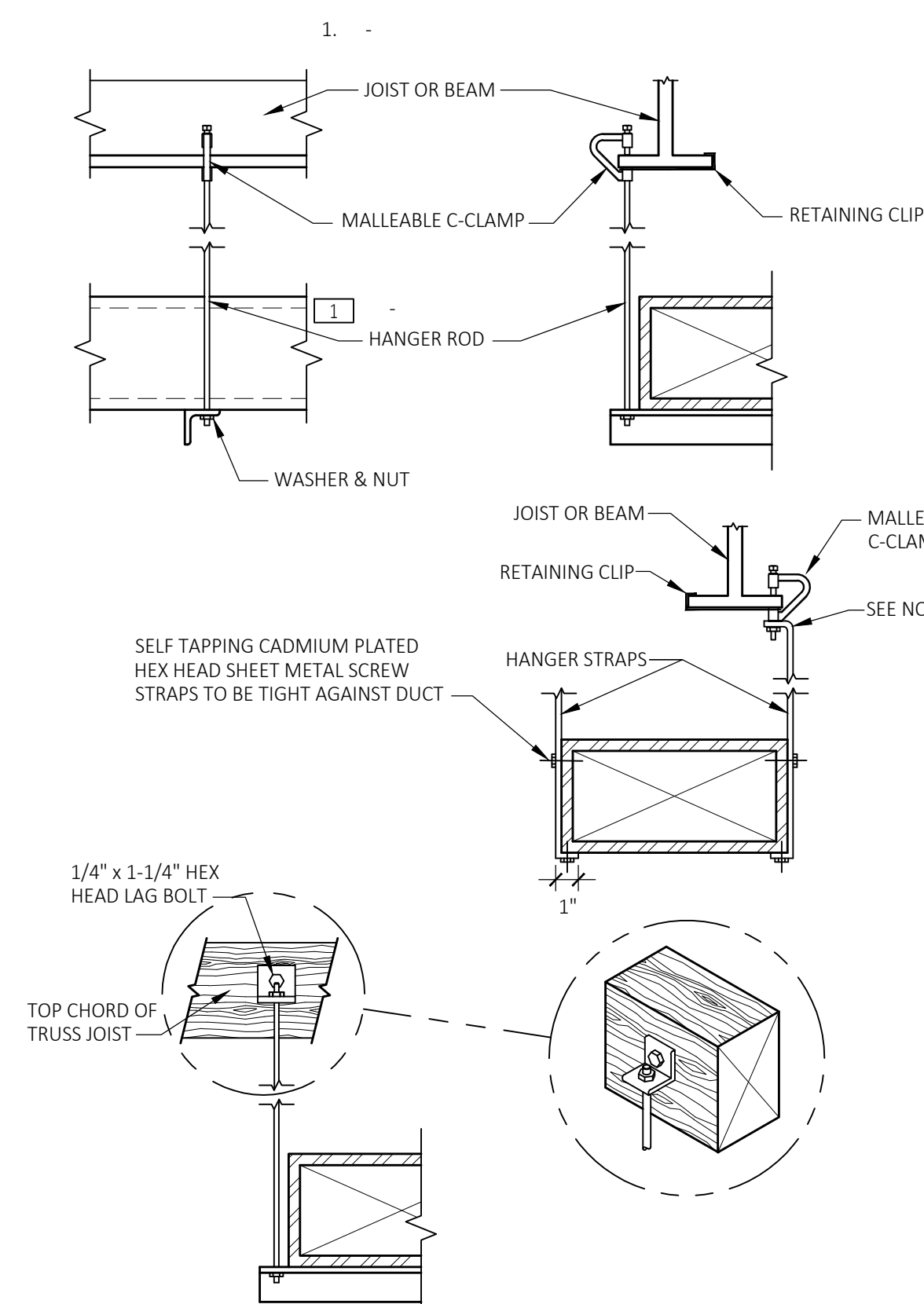
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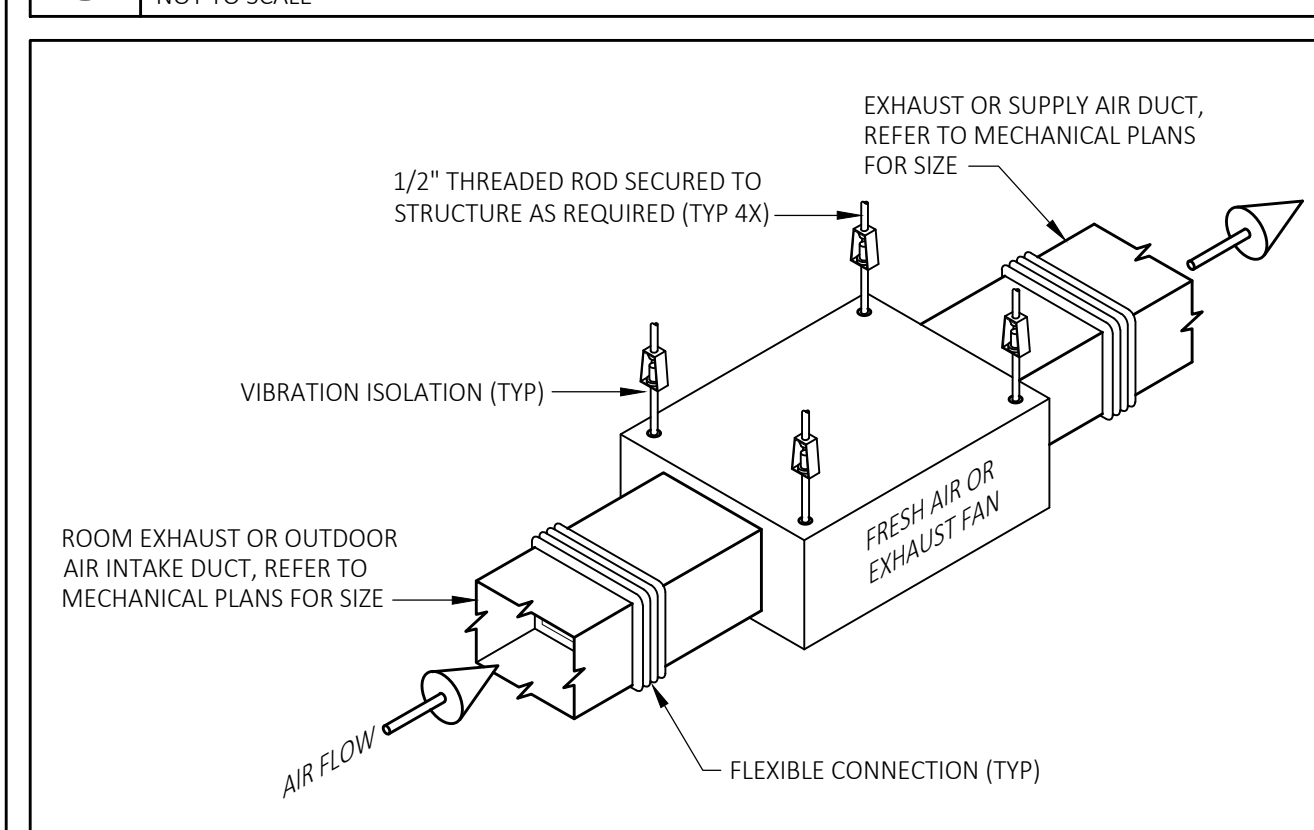
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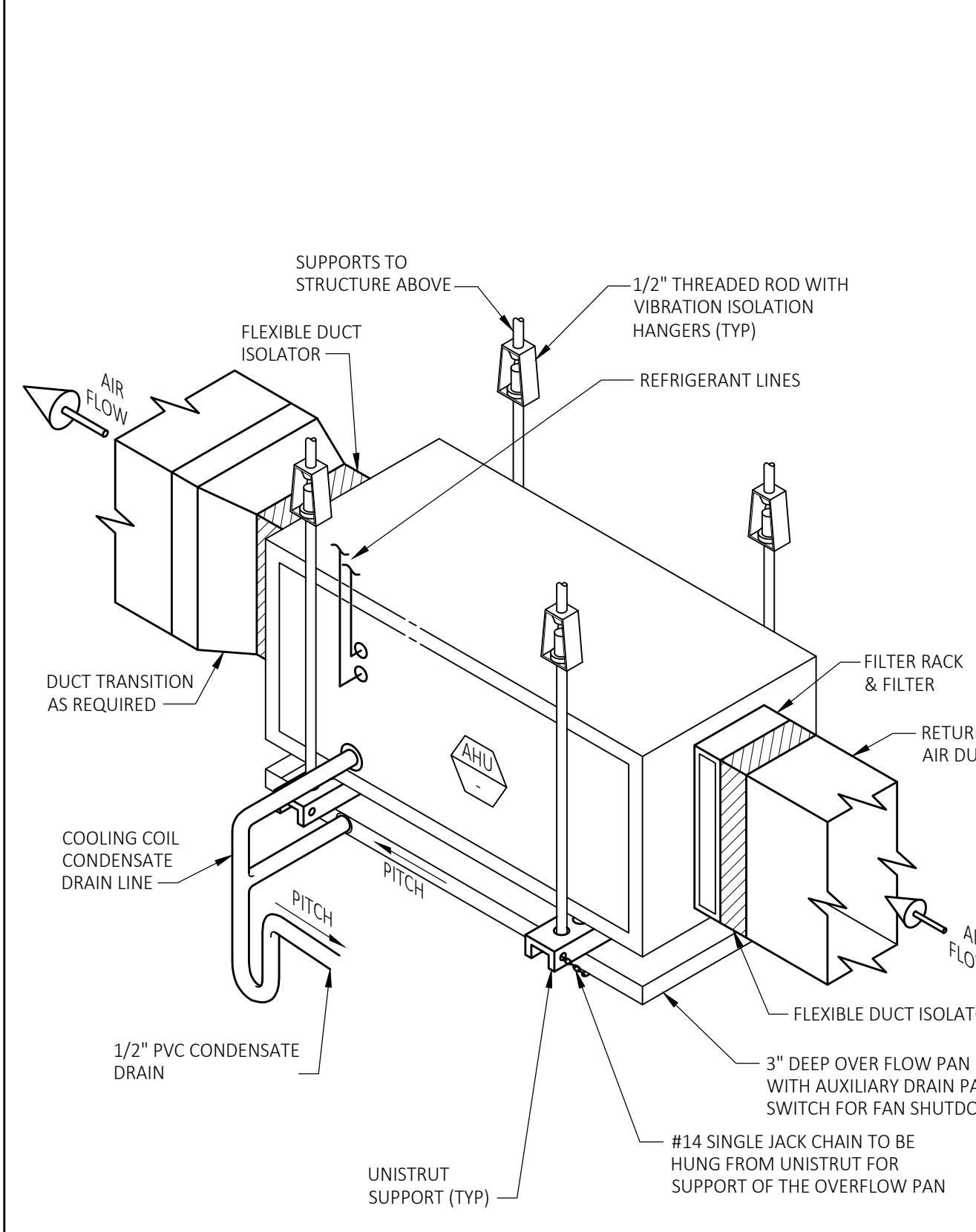
- NOTES:
1. ALL SUPPLY AIR, RETURN AIR AND OUTDOOR AIR DUCTS SHALL BE WRAPPED EXTERNALLY WITH DUCT INSULATION AS PER MECHANICAL SPECIFICATIONS.
  2. NO POP RIVETS ALLOWED. SELF-TAPPING SHEET METAL SCREWS ONLY.
  3. PREVENT BENDING OF STRAP AT 90° BEND UNDER LOAD.
  4. PROVIDE SUPPLEMENTAL STEEL WHERE NECESSARY TO SUPPORT DUCTWORK AT REQUIRED SPACING.

HANGER SIZES FOR RECTANGULAR DUCT			
MAX SIDE	HANGER	HORIZONTAL SUPPORT ANGLE	MAX SPACING
30"	1" x 18 GA. STRAP	NONE REQUIRED	10'-0"
36"	1/4" ROUND ROD	1-1/2" x 1-1/2" x 1/8"	8'-0"
48"	1/4" ROUND ROD	2" x 2" x 1/8"	8'-0"
60"	5/16" ROUND ROD	2" x 2" x 1/8"	8'-0"
84"	3/8" ROUND ROD	2" x 2" x 1/8"	8'-0"

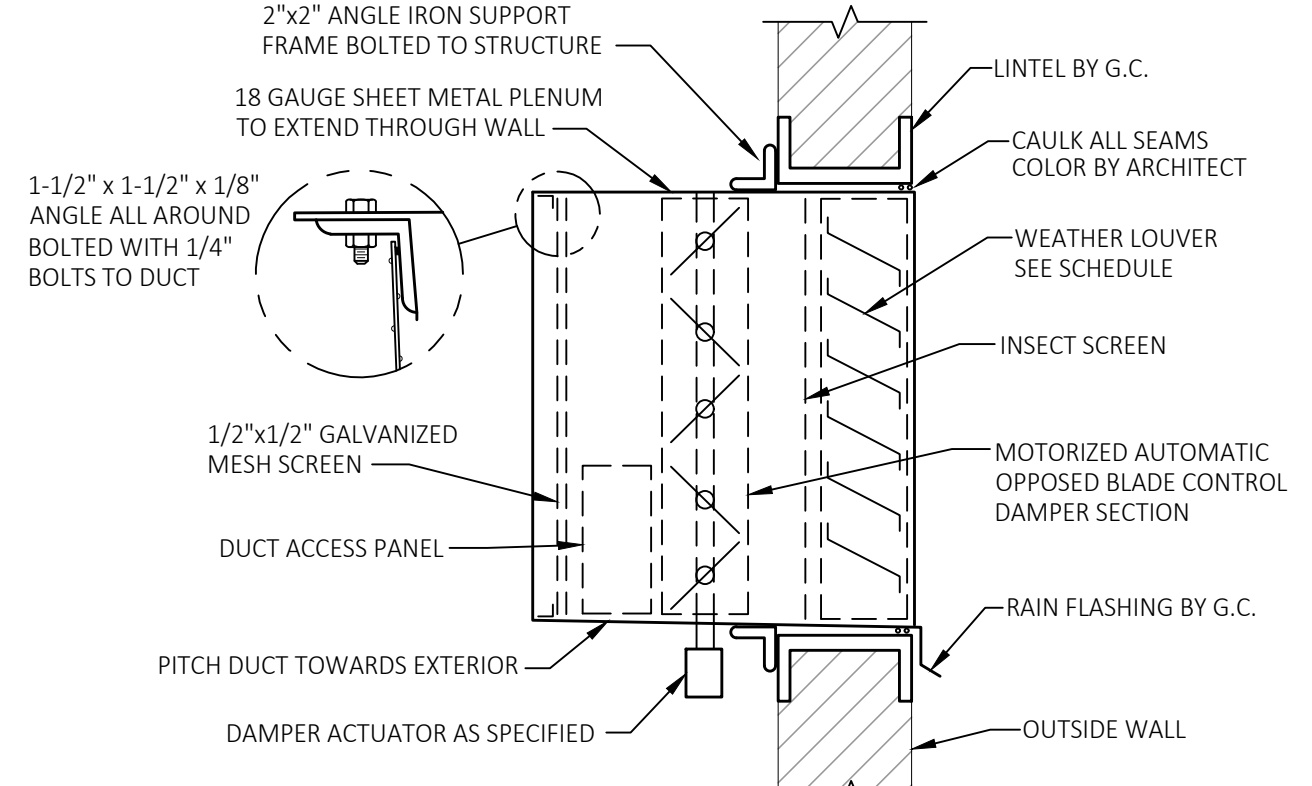
6 DUCT STRAP HANGER DETAIL  
NOT TO SCALE



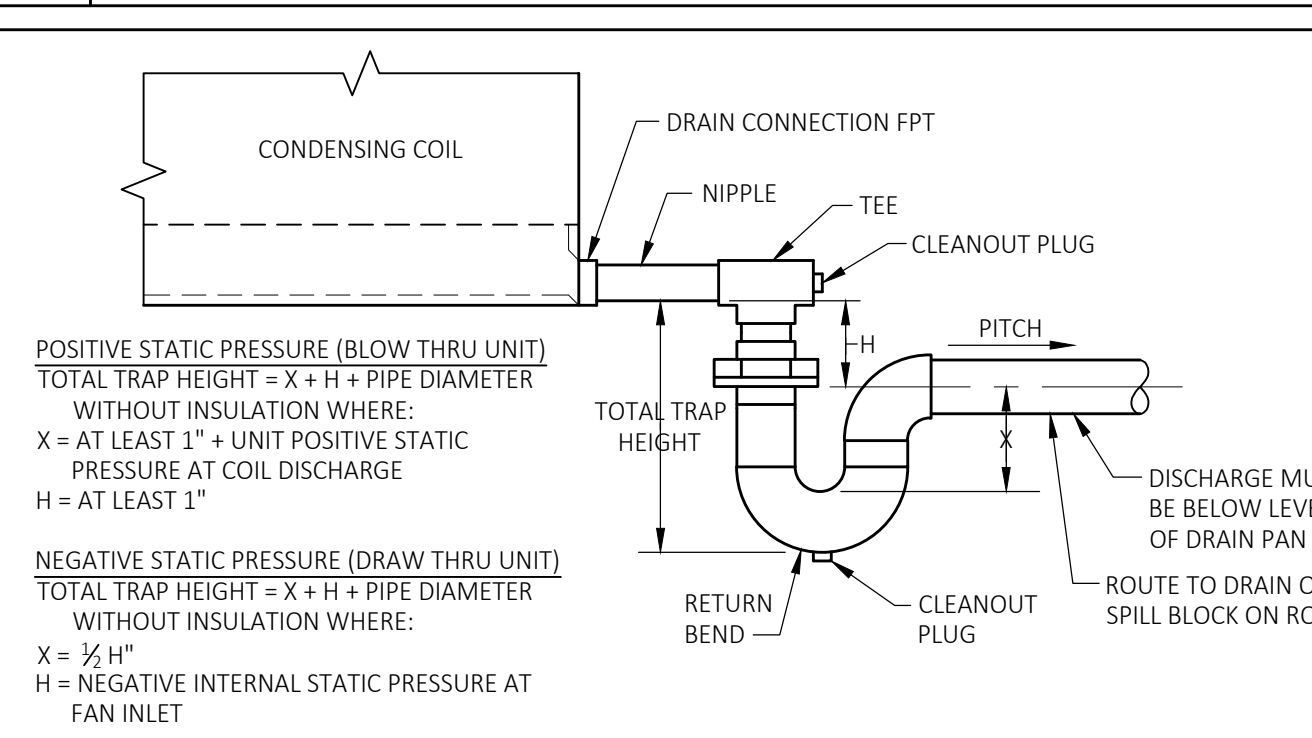
3 HANGING IN-LINE FAN DETAIL  
NOT TO SCALE



4 AIR HANDLING UNIT DETAIL  
NOT TO SCALE



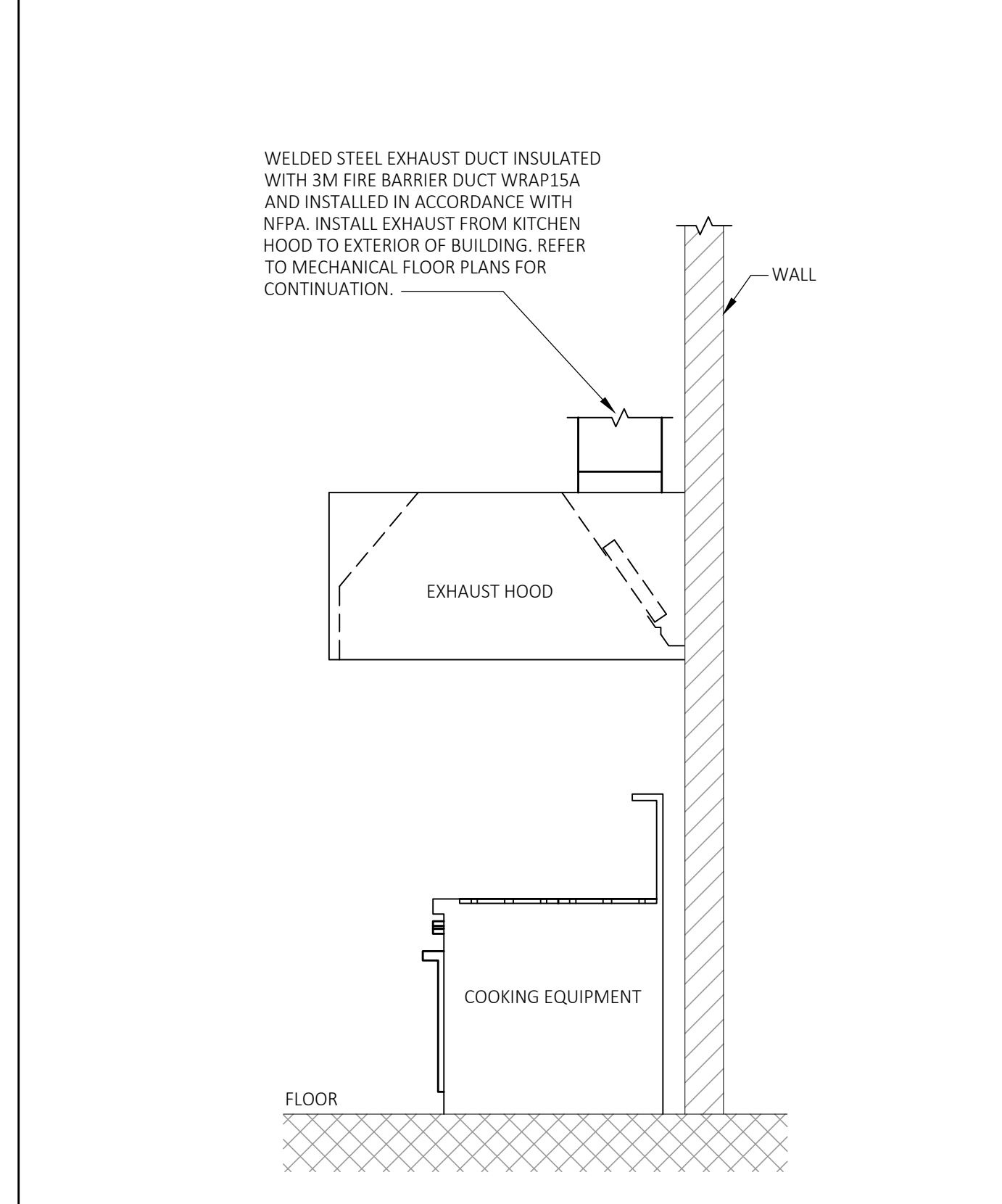
12 EXTERIOR WALL LOUVER W/MD FOR EXH AND INTAKE  
NOT TO SCALE



5 UNIT CONDENSATION TRAP PIPING DETAIL  
NOT TO SCALE

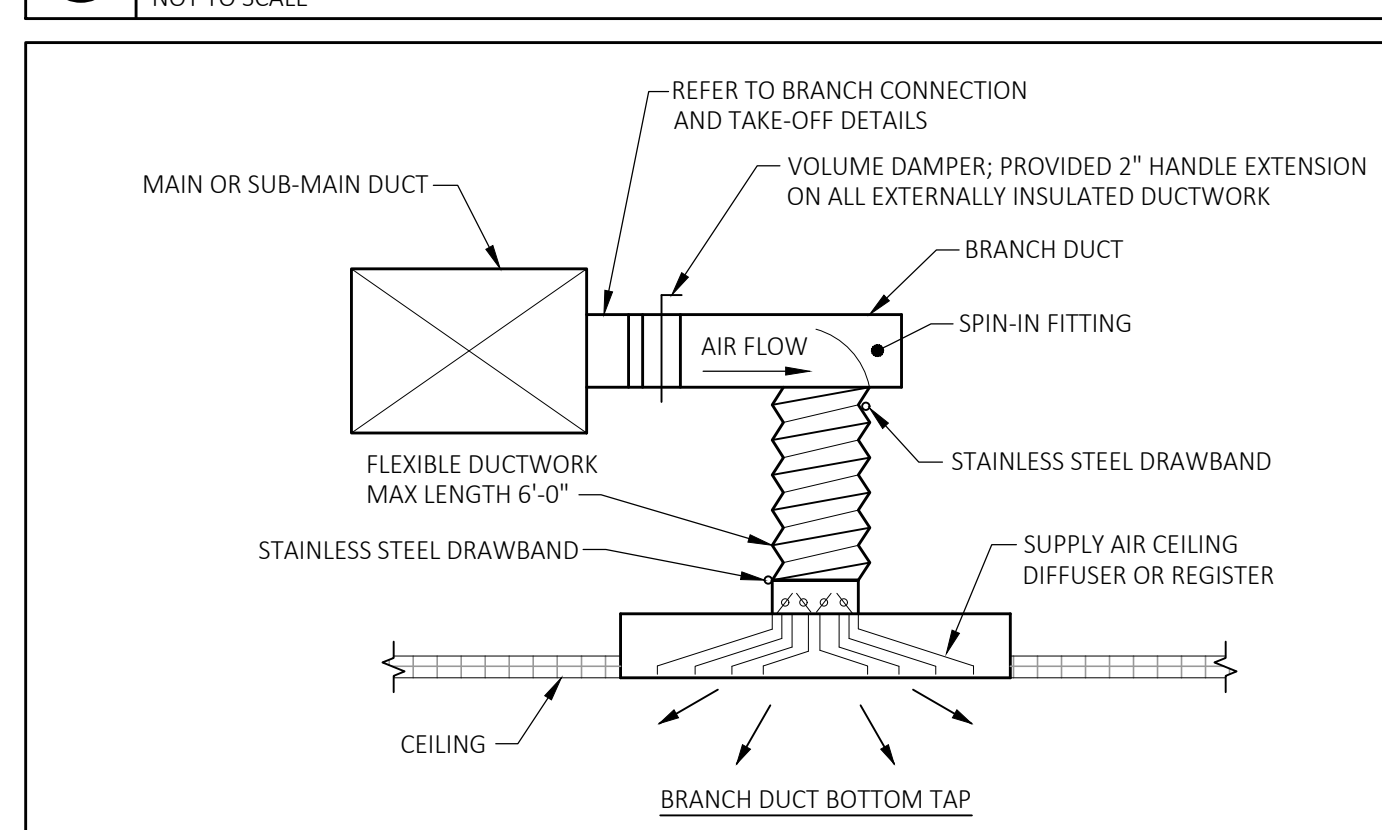
- NOTES:
1. ALLOW SUFFICIENT SPACE BELOW DRAIN PAN FOR TRAP
  2. PITCH DRAIN FOR PROPER RUN-OFF
  3. MANUALLY PRIME FILL TRAP BEFORE START-UP TO FORM INITIAL DRAIN SEAL
  4. SUPPORT DRAIN LINES TO PREVENT SAG AND CONDENSATE OVERFLOW

5 UNIT CONDENSATION TRAP PIPING DETAIL  
NOT TO SCALE

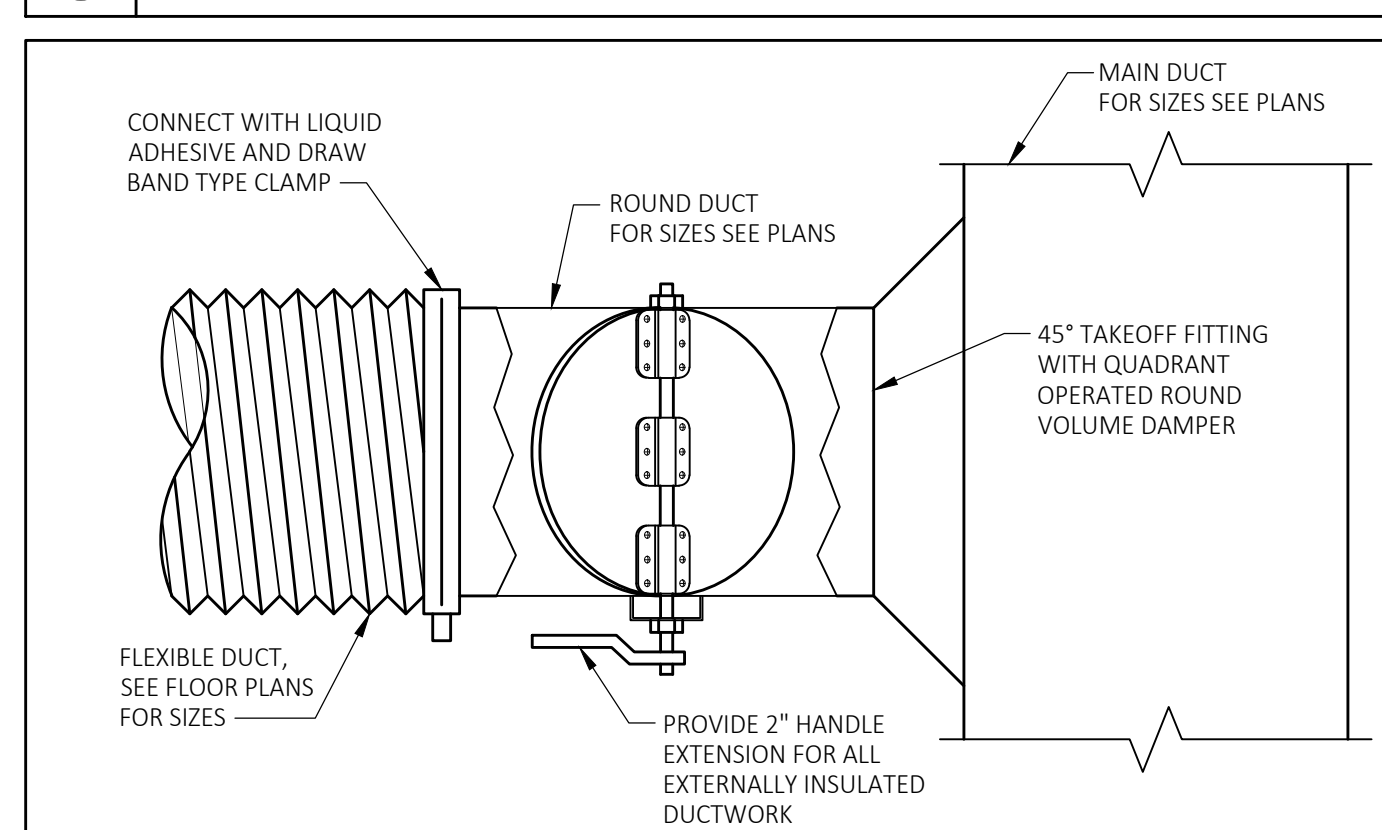


1 KITCHEN EXHAUST HOOD DETAIL  
NOT TO SCALE

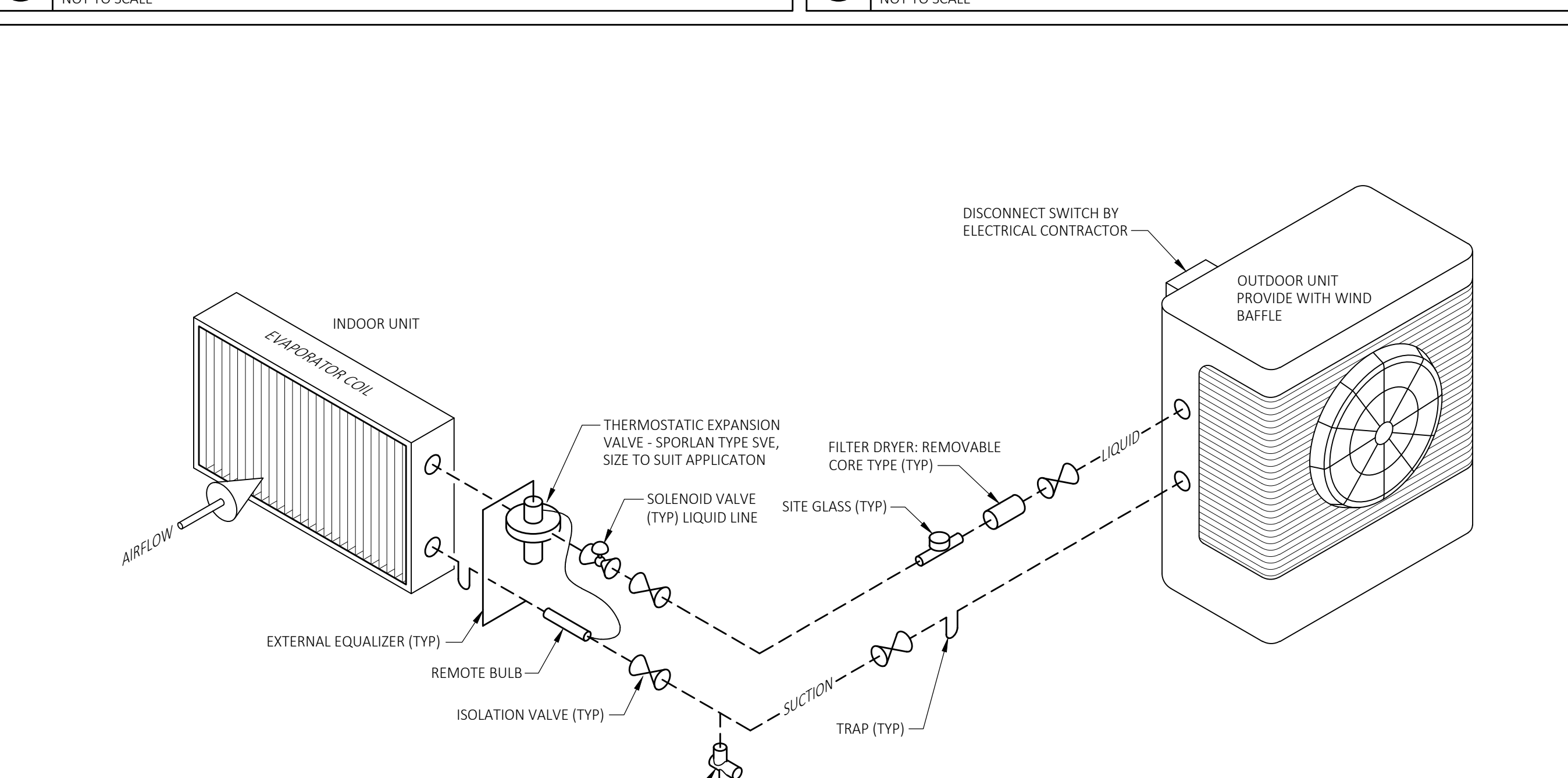
1 KITCHEN EXHAUST HOOD DETAIL  
NOT TO SCALE



2 DIFFUSER/REGISTER CONNECTION DETAIL  
NOT TO SCALE



4 ROUND BRANCH TAKEOFF DETAIL  
NOT TO SCALE



9 REFRIGERANT PIPING DIAGRAM  
NOT TO SCALE

- NOTES:
1. REFRIGERANT PIPING: SUCTION LINES WITH ISOLATION VALVE, SUCTION ACCUMULATOR AND CHARGING CONNECTION. LIQUID LINE WITH SITE GLASS HAVING DOUBLE PORTS WITH CAPS, FILTER DRYER, ISOLATION VALVES AND CHARGING CONNECTION. INSULATE PER SPECIFICATIONS.
  2. NOT ALL INSTALLATIONS REQUIRE A THERMOSTATIC EXPANSION VALVE. REFER TO SCHEDULE AND SPECIFICATION.
  3. CONTACT OWNER'S ROOFING CONTRACTOR FOR DETAIL OF SLIP-SHEET INSTALLATION UNDER SLEEPERS TO MAINTAIN THE EXISTING MANUFACTURER'S ROOF WARRANTY.

9 REFRIGERANT PIPING DIAGRAM  
NOT TO SCALE

# PAWTUCKET CITY HALL FIRE DEPARTMENT RESCUE ROOM & KITCHEN RENOVATIONS

137 ROOSEVELT AVENUE  
PAWTUCKET, RI 02860

SCALE **N.T.S.**  
DATE **04-29-2022**  
DRAWN BY **DD**  
REVIEWED BY **TW**  
JOB NO. **21-272**

DRAWING NAME  
**MECHANICAL DETAILS**

DRAWING NO.  
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## GENERAL DEMOLITION NOTES

- PRIOR TO SUBMITTING BID, VISIT SITE AND IDENTIFY EXISTING CONDITIONS AND DIFFICULTIES THAT WILL AFFECT WORK OF THIS SECTION. RENOVATION WORK WILL REQUIRE CAREFUL SITE EXAMINATION PRIOR TO BIDDING. NO COMPENSATION WILL BE GRANTED FOR ADDITIONAL WORK CAUSED BY UNFAMILIARITY WITH SITE CONDITIONS THAT ARE VISIBLE OR READILY CONSTRUED BY AN EXPERIENCED OBSERVER. FIELD VERIFY MEASUREMENTS AND CIRCUITING ARRANGEMENTS THAT ARE AS SHOWN ON DRAWINGS.
- FIELD VERIFY THAT ABANDONED WIRING AND EQUIPMENT SERVE ONLY ABANDONED FACILITIES.
- DEMOLITION DRAWINGS ARE BASED ON CASUAL FIELD OBSERVATION AND EXISTING RECORD DOCUMENTS. REPORT DISCREPANCIES TO ARCHITECT/ENGINEER BEFORE DISTURBING EXISTING INSTALLATIONS. THESE DRAWINGS HAVE BEEN COMPILED FROM THE BEST AVAILABLE INFORMATION AND ARE NOT INTENDED TO LIMIT THE SCOPE OF THE WORK. THE ELECTRICAL CONTRACTOR MAY ENCOUNTER HIDDEN OR COVERED CONDITIONS, NOT INDICATED IN THESE DOCUMENTS, REQUIRING THE ELECTRICAL CONTRACTOR TO PROVIDE ADDITIONAL WORK FOR THE COMPLETION OF HIS OR HER CONTRACT. IT WILL BE ASSUMED THAT THE CONTRACTOR HAS INSPECTED THE SITE PRIOR TO BIDDING AND VERIFIED THE INFORMATION SUPPLIED HEREIN AND ADDITIONAL WORK REQUIRED. BEGINNING OF DEMOLITION MEANS THE CONTRACTOR ACCEPTS EXISTING CONDITIONS. REFER TO ALL CONSTRUCTION DOCUMENTS TO GAIN A COMPLETE UNDERSTANDING OF THE DEMOLITION WORK REQUIRED.
- CUT, REMOVE AND LEGALLY DISPOSE OF SELECTED ELECTRICAL EQUIPMENT, COMPONENTS AND MATERIALS AS INDICATED, INCLUDING, BUT NOT LIMITED TO, REMOVAL OF ELECTRICAL ITEMS INDICATED TO BE REMOVED AND ITEMS MADE OBSOLETE BY THE WORK. DISCONNECT AND REMOVE ALL FIXTURES, WIRING DEVICES, CONDUIT AND FITTINGS, WIRING AND CABLE, FIRE ALARM DEVICES/COMPONENTS, HANGERS, SUPPORTS, WIREWAYS, AND ALL OTHER ELECTRICAL COMPONENTS MADE OBSOLETE BY THIS PROJECT. THE OWNER RESERVES THE OPTION OF SALVAGE RIGHTS TO DEMOLISHED MATERIAL AND REMOVED EQUIPMENT. THE CONTRACTOR SHALL COORDINATE WITH THE OWNER'S REPRESENTATIVE TO OBTAIN A LIST OF MATERIALS AND REMOVED EQUIPMENT TO BE TURNED OVER TO THE OWNER. ALL OTHER MATERIAL AND REMOVED EQUIPMENT NOT BEING SALVAGED BY THE OWNER SHALL BE DISPOSED OF BY THE CONTRACTOR. PULL ALL DEMOLISHED ELECTRICAL MATERIALS EXCEPT HAZARDOUS MATERIALS (PCB LIGHTING BALLASTS, FLUORESCENT LAMPS, ETC.) AS DETERMINED BY THE AUTHORITY HAVING JURISDICTION IN GENERAL CONTRACTOR'S DUMPSTER. ALL HAZARDOUS ELECTRICAL MATERIALS SHALL BE LEGALLY DISPOSED OF BY THE ELECTRICAL SUBCONTRACTOR.
- DISCONNECT ELECTRICAL SYSTEMS IN WALLS, FLOORS, AND CEILINGS SCHEDULED FOR REMOVAL.
- MAINTAIN ACCESS TO EXISTING ELECTRICAL INSTALLATIONS WHICH REMAIN ACTIVE. MODIFY INSTALLATION OR PROVIDE ACCESS PANELS AS APPROPRIATE. TEMPORARY WALL OPENINGS AND/OR MODIFICATIONS REQUIRED FOR REMOVAL/INSTALLATION OF EQUIPMENT SHALL BE PROVIDED AS NEEDED AND COORDINATED WITH THE GENERAL CONTRACTOR. ALL HVAC, PLUMBING AND FIRE PROTECTION EQUIPMENT SCHEDULED TO BE REMOVED OR RELOCATED SHALL BE DONE SO BY THE HVAC AND PLUMBING CONTRACTOR RESPECTIVELY. THE ELECTRICAL CONTRACTOR SHALL REMOVE STARTERS, DISCONNECT SWITCHES, WIRING, AND CONDUIT FOR SAID EQUIPMENT. REFER TO HVAC AND PLUMBING DRAWINGS FOR SCOPE OF WORK.
- PROVIDE TEMPORARY WIRING AND CONNECTIONS TO MAINTAIN EXISTING SYSTEMS IN SERVICE DURING CONSTRUCTION. WHEN WORK MUST BE PERFORMED ON ENERGIZED EQUIPMENT OR CIRCUITS USE PERSONNEL EXPERIENCED IN SUCH OPERATIONS. CONTRACTOR SHALL COORDINATE SHUTDOWN WITH OWNER PRIOR TO THE START OF WORK.
- EXISTING FIRE ALARM SYSTEM: MAINTAIN THE EXISTING SYSTEM IN SERVICE UNTIL THE MODIFIED/EXPANDED SYSTEM IS TESTED AND ACCEPTED BY THE FIRE DEPARTMENT. DISABLE SYSTEM ONLY TO MAKE SWITCHOVERS AND CONNECTIONS. NOTIFY OWNER, ARCHITECT/ENGINEER AND LOCAL FIRE DEPARTMENT AT LEAST TEN DAYS BEFORE PARTIALLY OR COMPLETELY DISABLING SYSTEM. MINIMIZE OUTAGE DURATION. MAKE TEMPORARY CONNECTIONS TO MAINTAIN SERVICE IN AREAS ADJACENT TO WORK AREA AS REQUIRED OR PROVIDE A "FIRE-WATCH" SYSTEM COORDINATED WITH THE LOCAL FIRE DEPARTMENT.
- EXTEND EXISTING ELECTRICAL INSTALLATIONS AS CALLED FOR ON THE DRAWINGS.
- REMOVE, RELOCATE, AND EXTEND EXISTING INSTALLATIONS TO ACCOMMODATE NEW CONSTRUCTION.
- REMOVE ABANDONED WIRING TO SOURCE OF SUPPLY.
- REMOVE EXPOSED ABANDONED CONDUIT, INCLUDING ABANDONED CONDUIT ABOVE ACCESSIBLE CEILING FINISHES. CUT CONDUIT FLUSH WITH WALLS AND FLOORS, AND PATCH SURFACES.
- DISCONNECT ABANDONED OUTLETS AND REMOVE DEVICES. REMOVE ABANDONED OUTLETS IF CONDUIT SERVICING THEM IS ABANDONED AND REMOVED. PROVIDE BLANK COVER FOR ABANDONED OUTLETS WHICH ARE NOT REMOVED.
- DISCONNECT AND REMOVE ELECTRICAL DEVICES AND EQUIPMENT SERVING UTILIZATION EQUIPMENT THAT HAS BEEN REMOVED.
- DISCONNECT AND REMOVE ABANDONED LIGHTING FIXTURES. REMOVE BRACKETS, STEMS, HANGERS, AND OTHER ACCESSORIES.
- DISCONNECT AND REMOVE OTHER SYSTEMS AND EQUIPMENT WITHIN THE WORK AREA MADE OBSOLETE BY THIS WORK.
- PROTECT ALL EXISTING WALLS, FLOORS, CEILINGS, LIGHT FIXTURES, ETC. WHICH ARE TO REMAIN AND TO PREVENT DAMAGE DURING ALL CONSTRUCTION PHASES. REPAIR ADJACENT CONSTRUCTION AND FINISHES DAMAGED DURING DEMOLITION AND EXTENSION WORK. PROVIDE AND MAINTAIN TEMPORARY PARTITIONS OR DUST BARRIERS ADEQUATE TO PREVENT THE SPREAD OF DUST AND DIRT TO ADJACENT AREAS. PROTECT THE STRUCTURE, FURNISHINGS, FINISHES, AND ADJACENT MATERIALS NOT INDICATED OR SCHEDULED TO BE REMOVED. PROTECT THE ELECTRICAL WORK AND THE WORK OF OTHERS IN A MANNER BEST SUITED TO THE PARTICULAR CASE. CORRECT ANY DAMAGE DONE TO ANY WORK AT NO ADDITIONAL COST.
- EXTEND EXISTING INSTALLATIONS USING MATERIALS AND METHODS COMPATIBLE WITH EXISTING ELECTRICAL INSTALLATIONS, OR AS SPECIFIED.
- CLEAN AND REPAIR EXISTING MATERIALS AND EQUIPMENT WHICH REMAIN OR ARE TO BE REUSED.
- PANELBOARDS: CLEAN EXPOSED SURFACES AND CHECK TIGHTNESS OF ELECTRICAL CONNECTIONS. REPLACE DAMAGED CIRCUIT BREAKERS AND PROVIDE CLOSURE PLATES FOR VACANT POSITIONS. PROVIDE TYPED CIRCUIT DIRECTORY SHOWING REVISED CIRCUITING ARRANGEMENT.
- EXISTING ELECTRICAL EQUIPMENT AND WIRING NOT SHOWN ON DOCUMENTS OR ADDRESSED BY NOTES ABOVE SHALL BE CONSIDERED EXISTING TO REMAIN.

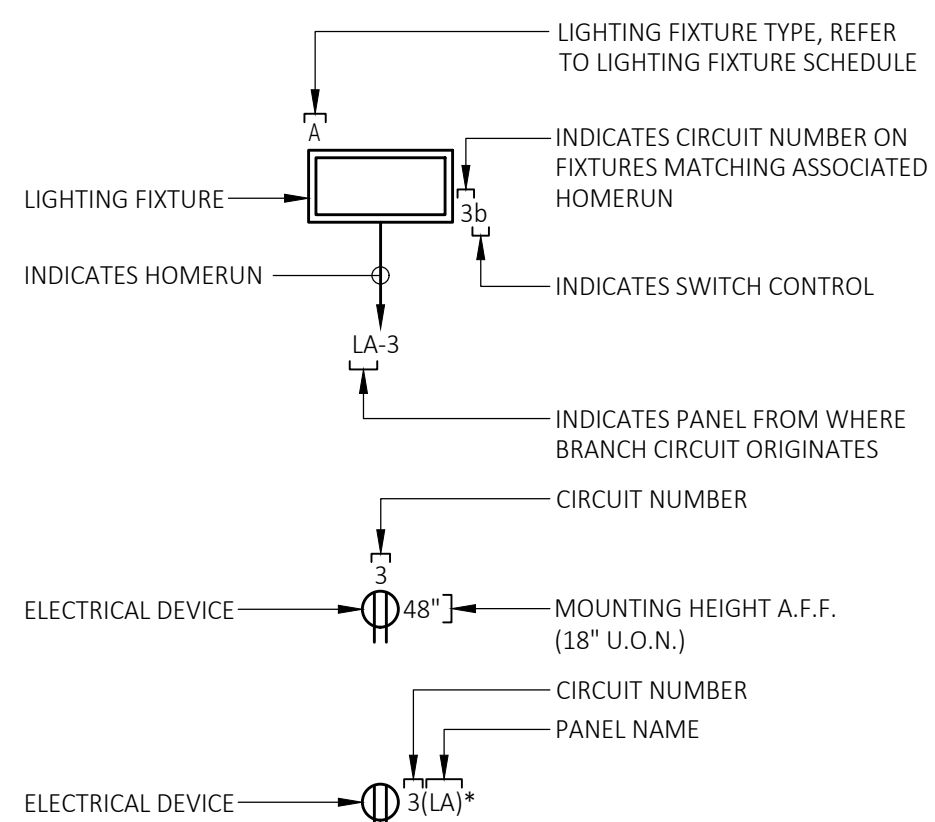
## CIRCUIT TRACING NOTE

ELECTRICAL CONTRACTOR SHALL UPDATE ALL EXISTING PANELBOARD DIRECTORIES TO REFLECT ALL CIRCUITS MADE SPARE FROM DEMOLITION. ALL EXISTING CIRCUIT BREAKERS IN ALL EXISTING PANELBOARDS SHOWN ON THE DRAWINGS SHALL BE TRACED OUT AND LABELED IN PANELBOARD OF ORIGIN. ALL CIRCUITS THAT ARE NO LONGER IN USE SHALL BE PULLED BACK TO PANEL OF ORIGIN. ALL CIRCUIT BREAKERS NOT BEING UTILIZED SHALL BE LABELED AS SPARE AND PUT IN THE OPEN (OFF) POSITION.

## GENERAL NEW WORK NOTES

- USE #10 CONDUCTORS FOR ALL HOMERUNS OVER 100 FEET IN LENGTH.
- LOCATIONS SHOWN FOR CONNECTIONS TO EQUIPMENT ARE DIAGRAMMATIC. INSTALL FOR EASE OF MAINTENANCE AND TO SUIT EQUIPMENT.
- PROVIDE ALL REQUIRED PULL BOXES, JUNCTION BOXES, AND DISCONNECT SWITCHES.
- DO NOT INSTALL OUTLET BOXES BACK TO BACK.
- COLOR CODE ALL WIRING.
- PROVIDE CONDUIT SLEEVES AS REQUIRED. THROUGH FIRE RATED SEPARATIONS, FIRE SEAL AFTER WIRING IS COMPLETE.
- SUPPORT EACH LIGHTING FIXTURE INDEPENDENTLY OF THE SUSPENDED CEILING SYSTEM AND COORDINATE LOCATIONS WITH REFLECTED CEILING PLAN AND OTHER TRADES TO AVOID CONFLICT.
- PROVIDE A NYLON PULL CORD IN ALL EMPTY CONDUITS.
- VERIFY ALL CEILING TYPES AND MATERIALS BEFORE ORDERING ANY LIGHTING FIXTURES.
- THE LOCATIONS OF HVAC EQUIPMENT SHOWN ON THESE DRAWINGS ARE APPROXIMATE. FOR EXACT LOCATIONS REFER TO HVAC DRAWINGS AND SHOP DRAWINGS.
- CONCEAL ALL WIRING UNLESS OTHERWISE NOTED.
- PROVIDE ALL GROUNDING INCLUDING GREEN EQUIPMENT GROUND IN ALL RACEWAYS. GROUND BUILDING SERVICE ACCORDING TO NEC AND ALSO TO STREET SIDE OF WATER METER AND TO APPROVED GROUND ROD.
- CIRCUIT NUMBERS INDICATE PANEL AND CIRCUIT BREAKER FOR EQUIPMENT CONNECTIONS. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO INSTALL ALL REQUIRED WIRING PER NATIONAL ELECTRIC CODE AND PROJECT SPECIFICATIONS TO PROPERLY ENERGIZE THE ELECTRICAL SYSTEM. ALL WIRING SHALL BE RUN IN A NEAT AND ORDERLY MANNER.
- WIRING SHALL NOT BE LAID ON, OR ATTACHED TO THE SUSPENDED CEILING OR ITS SUPPORT WIRES. ALL CABLES SHALL BE RUN PARALLEL OR PERPENDICULAR TO WALLS. DO NOT RUN CABLES DIAGONALLY THROUGH ANY SPACE.
- WHERE THE NUMBER OF CURRENT CARRYING CONDUCTORS IN A RACEWAY OR CABLE EXCEEDS THREE, THE ALLOWABLE AMPACITY SHALL BE REDUCED PER NATIONAL ELECTRIC CODE TABLE BASED ON NO DIVERSITY. CONSIDER NEUTRALS TO BE CURRENT CARRYING CONDUCTORS.
- DO NOT COMBINE CIRCUITS OR USE COMMON NEUTRALS
- LABEL ("BROTHER P-TOUCH LABELING SYSTEM" OR APPROVED EQUAL) OR ENGRAVE EACH RECEPTACLE PLATE WITH PANEL DESIGNATION AND CIRCUIT NUMBER.
- PROVIDE GROUNDING AND BONDING BUSHINGS FOR SERVICE RACEWAYS PER NEC. SIZE THE BONDING JUMPER PER NEC.
- GROUND ALL TRANSFORMERS ACCORDING TO NEC HANDBOOK (GROUNDING ELECTRODE CONDUCTOR CONNECTION AT TRANSFORMER). SIZE BONDING JUMPER PER NEC.
- CONTRACTOR SHALL VISIT THE SITE AND FAMILIARIZE HIMSELF WITH THE EXISTING CONDITIONS. NO CLAIM FOR EXTRA COMPENSATION SHALL BE ENTERTAINED FOR WORK WHICH A PRELIMINARY EXAMINATION WOULD HAVE REVEALED. THE SUBMISSION OF A BID WILL BE CONSIDERED AS ACKNOWLEDGMENT ON THE PART OF THE BIDDER OF HIS VISITATION TO THE SITE.
- OBTAIN ALL NECESSARY PERMITS AND CERTIFICATES. PRESENT SATISFACTORY PROOF OF FINAL INSPECTION AND APPROVAL BY AUTHORITIES HAVING JURISDICTION.
- MAINTAIN CORRECT PHASE SEQUENCE OF ALL FEEDERS AND CIRCUITS BY ESTABLISHING PHASE IDENTIFICATION AND MAINTAINING CORRECT RELATIONSHIP THROUGHOUT THE SYSTEM. PROVIDE LINE BALANCE WITHIN 10% OF NORMAL LOADS.

## CIRCUITING LEGEND



\*BRANCH CIRCUIT SOURCE PANEL BOARD INDICATED IN PARENTHESIS FOR REFERENCE WHEN HOMERUN IS NOT VISIBLE ON PLAN.

### GENERAL NOTES:

- WIRING AND CONDUIT SHALL BE REQUIRED BETWEEN ALL LIGHTING FIXTURES, RECEPTACLES, OUTLETS, ETC. INDICATED WITH CIRCUIT NUMBERS AND PANEL DESIGNATIONS. REFER TO SPECIFICATIONS FOR APPLICABLE MEANS AND METHODS.
- ALTHOUGH ALL BRANCH CIRCUIT WIRE AND CONDUIT IS NOT SHOWN, IT IS THE INTENT OF THESE DOCUMENTS THAT A COMPLETE BRANCH CIRCUIT WIRING SYSTEM BE INSTALLED.
- WIRING SHALL BE 2#12+1#12G IN 3/4" C MINIMUM.

## ABBREVIATIONS

ALL ABBREVIATIONS SHOWN ARE NOT NECESSARILY USED ON THIS PROJECT

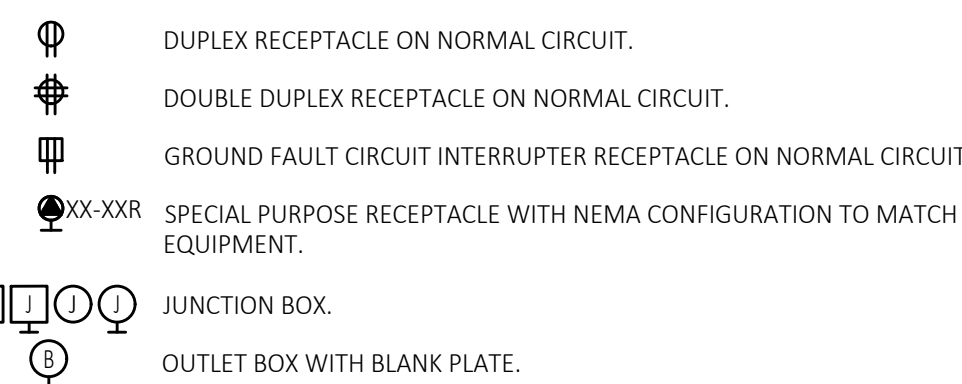
A/AMP	AMPERE	J/B	JUNCTION BOX
AC	ALTERNATING CURRENT	KVA	KILOVOLT-AMPERE
ADA	AMERICAN WITH DISABILITIES ACT	KW	KILOWATT
AF	AMPERE FRAME	KWH	KILOWATT HOURS
AFF	ABOVE FINISHED FLOOR	LTG	LIGHTING
AFG	ABOVE FINISHED GRADE	MCB	MAIN CIRCUIT BREAKER
AHJ	AUTHORITY HAVING JURISDICTION	M/G	MOTOR/GENERATOR SET
AIC	AMPERE INTERRUPTING CAPACITY	MH	MAIN HOLE
ALCS	AUTOMATED LIGHTING CONTROL SYSTEM	MLO	MAIN LUG ONLY
AL	ALUMINUM	MTD	MOUNTED
AT	AMPERE TRIP	MTG	MOUNTING
ATS	AUTOMATIC TRANSFER SWITCH	N	NEUTRAL
AWG	AMERICAN WIRE GAUGE	NA	NOT APPLICABLE
AV	AUDIO VISUAL	NC	NORMALLY CLOSED CONTACT
B	BURIED	NEC	NATIONAL ELECTRICAL CODE
BFG	BELOW FINISHED GRADE	NF	NOT FUSIBLE
BOF	BOTTOM OF FIXTURE	NG	NATIONAL GRID (ELECTRIC UTILITY)
C	CONDUIT	NL	NIGHT LIGHT
CA	CABLE	NIC	NOT IN CONTRACT
CAT	CATALOG	NO	NORMALLY OPEN CONTACT
CATV	CABLE TELEVISION	NTS	NOT TO SCALE
CCTV	CLOSED CIRCUIT TELEVISION SYSTEM	#	NUMBER
CB	CIRCUIT BREAKER	OPD	OVER CURRENT PROTECTION DEVICE
CBA	COLOR BY ARCHITECT	P	POLE
CD	CANDELA	PH	PHASE
CKT	CIRCUITS	POS	PROVIDED UNDER OTHER SECTIONS
CPU	CENTRAL PROCESSING UNIT	POTS	PLAIN ORDINARY TELEPHONE
CONT.	CONTINUATION	PVC	POLYVINYL CHLORIDE
CU	COPPER	PWR	POWER
∕E	CENTERLINE	RGS	RIGID GALVANIZED STEEL
dB	DECIBEL	RIEC	RHODE ISLAND ELECTRICAL CODE
DC	DIRECT CURRENT	RMS	ROOT MEAN SQUARE VALUE
DN	DOWN	RPM	REVOLUTIONS PER MINUTE
DWG	DRAWING	SN	SOLID NEUTRAL
EC	ELECTRICAL CONTRACTOR	SWBD	SWITCHBOARD
ECPS	EMPTY CONDUIT WITH PULLSTRING	TTB	TELEPHONE TERMINAL BOARD
EG	EQUIPMENT GROUND	TEL	TELEPHONE
ELEV	ELEVATION	TML	TERMINAL
EMT	ELECTRIC METALLIC TUBING	TSP	TWISTED SHIELDED-PAIR
F	FAHRENHEIT	TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSOR
FA	FIRE ALARM		
FACP	FIRE ALARM CONTROL PANEL	TYP	TYPICAL
FBA	FINISH BY ARCHITECT	UG	UNDERGROUND
FDR	FEEDER	UL	UNDERWRITERS LABORATORIES
FLA	FULL LOAD AMPERES	UNO	UNLESS NOTED OTHERWISE
FUMT	FLEXIBLE LIQUID TIGHT METALLIC TUBING	UNON	UNLESS OTHERWISE NOTED
FREQ	FREQUENCY	UPS	UNINTERRUPTIBLE POWER SUPPLY
G	GROUND	UTP	UNSHIELDED TWISTED-PAIR
GEC	GROUNDING ELECTRODE CONDUCTOR	V	VOLTS
GFCI	GROUND FAULT CIRCUIT INTERRUPTER	VA	VOLT-AMPERE
GND	GROUND	VO	TELEPHONE
HH	HANDHOLE	VFD	VARIABLE FREQUENCY DRIVE
HP	HORSEPOWER	VSD	VARIABLE SPEED DRIVE
HVAC	HEATING, VENTILATION, AND AIR CONDITIONING	W	WATTS
HZ	HERTZ	W/	WITH
IG	ISOLATED GROUND	WP	WEATHERPROOF
		XFM/T	TRANSFORMER

## POWER OUTLETS & DEVICES LEGEND

ALL ITEMS SHOWN ARE NOT NECESSARILY USED ON THIS PROJECT

POWER RECEPTACLES:  
ALL RECEPTACLES SHALL BE MOUNTED AT 18" A.F.F. TO CENTER, UNLESS OTHERWISE NOTED. THE FOLLOWING DESIGNATIONS SHALL APPLY TO ALL RECEPTACLES TYPES:

- C = MOUNTED AT 6" ABOVE BACK SPLASH TO BOTTOM, REFER TO ARCHITECTURAL ELEVATIONS FOR COORDINATION.
- CLG = CEILING MOUNTED.
- HD = HAND DRYER
- IG = ISOLATED GROUND.
- M = FOR MICROWAVE
- MF = MOUNTED IN FURNITURE, SEE ARCHITECTURAL DRAWINGS.
- TL = TWIST LOCK.
- R = FOR REFRIGERATOR; PROVIDE 20A/1P GFCI BREAKER UNLESS OTHERWISE NOTED.
- WP = WEATHERPROOF.



## AUDIO/VISUAL LEGEND

ALL ITEMS SHOWN ARE NOT NECESSARILY USED ON THIS PROJECT

AUDIO/VISUAL OUTLETS:  
COORDINATE ALL LOCATIONS AND MOUNTING HEIGHTS WITH OWNERS AUDIO VISUAL VENDOR PRIOR TO ROUGH-IN. MOUNT TYPICAL OUTLETS AT 18" A.F.F. TO CENTER UNLESS OTHERWISE DIRECTED. THE FOLLOWING DESIGNATIONS SHALL APPLY TO ALL OUTLET TYPES:

- C = INDICATES MOUNTED AT 6" ABOVE BACK SPLASH TO BOTTOM, REFER TO ARCHITECTURAL ELEVATIONS.
- F = INDICATES FLOOR MOUNTED.
- P = INDICATES MOUNTED AT 47" A.F.F.
- W = INDICATES MOUNTED AT 54" A.F.F.
- H = INDICATES MOUNTED AT 82" A.F.F.



## LIGHTING CONTROL LEGEND

ALL ITEMS SHOWN ARE NOT NECESSARILY USED ON THIS PROJECT

- S SINGLE POLE SWITCH. SUBSCRIPT INDICATES LIGHT FIXTURE CONTROL.
- WALLBOX ULTRASONIC OCCUPANCY SENSOR; SENSORWORK #SWX-121 (COVER PLATE BY E.C.) SET FOR AUTO "ON", AUTO "OFF" OPERATION
- CEILING MOUNTED OCCUPANCY SENSOR; SENSORWORK #SWX-222-1-2. SET FOR AUTO "ON", AUTO "OFF" OPERATION

## FIRE ALARM LEGEND

ALL ITEMS SHOWN ARE NOT NECESSARILY USED ON THIS PROJECT

- FIRE ALARM DEVICES:  
ALL FIRE ALARM NOTIFICATION DEVICES SHALL BE MOUNTED AT 80" A.F.F. TO BOTTOM OF STROBE LENS, UNLESS OTHERWISE NOTED. ALL FIRE ALARM PULL STATIONS SHALL BE MOUNTED AT 48" A.F.F. TO CENTER OF DEVICE. REMOTE TEST SWITCHES SHALL BE MOUNTED AT 7'-0" A.F.F. IN CORRIDOR BELOW DUCT SMOKE DETECTOR. THE FOLLOWING DESIGNATIONS SHALL APPLY TO ALL FIRE ALARM DEVICES; UNLESS OTHERWISE NOTED:
- WP = WEATHERPROOF.  
C = CEILING MOUNTED.  
K = KEY OPERATED TEST SWITCH.  
WG = WIRE GUARD.  
SC = STOPPER COVER.
- FIRE ALARM SMOKE DETECTOR.
- FIRE ALARM HEAT DETECTOR, COMBINATION RATE-OF-RISE AND ONE HUNDRED THIRTY-FIVE DEGREES (135°) F FIXED TEMPERATURE.
- FIRE ALARM DUCT MOUNTED SMOKE DETECTOR, INSTALLED BY MECHANICAL CONTRACTOR, WIRED AND FURNISHED BY ELECTRICAL CONTRACTOR.
- FIRE ALARM CONTROL PANEL.
- FIRE ALARM KEYED DUCT SMOKE REMOTE TEST STATION.
- FIRE ALARM PULL STATION.
- FIRE ALARM MONITOR MODULE.
- FIRE ALARM CONTROL MODULE. PROVIDE AN INTERMEDIATE RELAY TO SUIT LOAD.
- INTERMEDIATE RELAY, PROVIDE AS NEEDED.
- FIRE ALARM STROBE ONLY; CEILING MOUNTED. CANDELA RATING SHALL BE 15, UNLESS OTHERWISE NOTED.
- HORN/STROBE COMBINATION; CANDELA RATING SHALL BE 15, UNLESS OTHERWISE NOTED.
- LOW FREQUENCY FIRE ALARM HORN ONLY.
- FIRE ALARM BATTERY CABINET.
- FIRE ALARM ISOLATION MODULE.
- SELF CONTAINED CARBON MONOXIDE DETECTOR EQUAL TO BRK#CO2250B
- FIRE ALARM SYSTEM MASTERBOX.

## MOTOR AND CONTROLS LEGEND

ALL ITEMS SHOWN ARE NOT NECESSARILY USED ON THIS PROJECT

- S SINGLE POLE MOTOR RATED SWITCH WITH OVERLOAD HEATER (MANUAL MOTOR STARTER).
- FUSED DISCONNECT SWITCH WITH RATINGS.
- NEMA RATING. "WP" INDICATES RAIN TIGHT
- INDICATES DUAL ELEMENT FUSES
- NUMBER OF POLES
- FUSE SIZE. "NF" INDICATES NON FUSED
- SWITCH SIZE
- EQUIPMENT TAG, REFER TO MECHANICAL EQUIPMENT SCHEDULE FOR MORE INFORMATION.

## TELECOMMUNICATION LEGEND

ALL ITEMS SHOWN ARE NOT NECESSARILY USED ON THIS PROJECT

- TELECOMMUNICATION OUTLETS:  
ALL OUTLETS SHALL BE MOUNTED AT 18" A.F.F. TO CENTER, UNLESS OTHERWISE NOTED. THE FOLLOWING DESIGNATIONS SHALL APPLY TO ALL OUTLET TYPES:
- C = INDICATES MOUNTED AT 6" ABOVE BACK SPLASH TO BOTTOM, REFER TO ARCHITECTURAL ELEVATIONS.
- W = INDICATES MOUNTED AT 54" A.F.F.
- TELECOMMUNICATIONS OUTLET, REFER TO TELECOMMUNICATIONS CONDUIT DETAIL FOR ADDITIONAL INFORMATION.

## LIGHTING FIXTURE LEGEND

ALL ITEMS SHOWN ARE NOT NECESSARILY USED ON THIS PROJECT

- A LIGHT FIXTURE (LUMINAIRE) AND OUTLET ON NORMAL CIRCUIT. LETTER INDICATES TYPE. SUBSCRIPT INDICATES CONTROL AND CIRCUIT NUMBER.
- B LIGHT FIXTURE (LUMINAIRE) AND OUTLET ON NORMAL CIRCUIT. LETTER INDICATES TYPE. SUBSCRIPT INDICATES CONTROL AND CIRCUIT NUMBER.
- X EXIT SIGN WITH EMERGENCY LIGHTS. SHADING DENOTES NUMBER AND ORIENTATION OF SIGN FACE(S).

## BRANCH CIRCUIT & FEEDER LEGEND

ALL ITEMS SHOWN ARE NOT NECESSARILY USED ON THIS PROJECT

- BRANCH CIRCUIT OR FEEDER CONCEALED IN FINISHED AREAS.
- BRANCH CIRCUIT OR FEEDER CONCEALED IN OR UNDER FLOOR SLAB.
- BRANCH CIRCUIT OR FEEDER TURNING UP TOWARDS OBSERVER.
- BRANCH CIRCUIT OR FEEDER TURNING DOWN AWAY FROM OBSERVER.
- CONDUIT STUBBED ABOVE CEILING.
- BRANCH CIRCUIT HOME RUN TICKS INDICATE QUANTITY OF CONDUCTORS, GROUND CONDUCTORS ARE NOT INDICATED, NO TICKS INDICATES 2#12+12-3/4" C MINIMUM. "R22A/1,3,5" INDICATES PANEL AND CIRCUIT DESIGNATION FROM WHICH HOMERUN SHALL ORIGINATE. EACH CIRCUIT SHALL BE 20A/1P (20 AMP/SINGLE POLE), UNLESS OTHERWISE NOTED.
- FEEDER HOMERUN. REFER TO LEGEND OF FEEDER SIZES FOR CONDUCTOR AND RACEWAY REQUIREMENTS DESIGNATED INSIDE TAG. "R22A/1,3,5" INDICATES PANEL AND CIRCUIT NUMBER DESIGNATION FROM WHICH HOME RUN SHALL ORIGINATE. 100A/3P INDICATES 100 AMPERE, 3 POLE CIRCUIT BREAKER.
- FLEXIBLE CONNECTION TO EQUIPMENT. RACEWAY AND CONDUCTOR RATING TO MATCH ASSOCIATED BRANCH CIRCUIT OR FEEDER.

## EXISTING ELECTRICAL EQUIPMENT LEGEND

ALL ITEMS SHOWN ARE NOT NECESSARILY USED ON THIS PROJECT

- EXISTING ELECTRICAL EQUIPMENT WITHOUT A DESIGNATION IS TO REMAIN.
- "XE" INDICATES EXISTING ELECTRICAL EQUIPMENT WHICH IS TO BE REMOVED. PULL BACK WIRING AND CONDUIT BACK TO NEXT ACTIVE OUTLET OR POWER SOURCE.
- "XR" INDICATES EXISTING ELECTRICAL EQUIPMENT TO BE REMOVED AND RELOCATED. EXISTING CIRCUIT SHALL BE EXTENDED TO NEW LOCATION OF RELOCATED EXISTING ELECTRICAL EQUIPMENT.
- "XN" INDICATES NEW LOCATION OF RELOCATED EXISTING ELECTRICAL EQUIPMENT.
- "XD" INDICATES EXISTING EQUIPMENT/DEVICE TO REMAIN. EXISTING CIRCUIT/ WIRING SHALL BE REMOVED. PULL BACK WIRING AND CONDUIT BACK TO NEXT ACTIVE OUTLET OR POWER SOURCE. ALL HVAC/PLUMBING INTERLOCKING WIRING SHALL REMAIN. REFER TO RENOVATION PLANS FOR NEW CIRCUIT INFORMATION.
- "XW" INDICATES EXISTING EQUIPMENT/DEVICE TO BE REMOVED. EXISTING CIRCUIT/WIRING AND BACK BOX SHALL REMAIN. NEW DEVICE SHALL BE LOCATED IN PLACE. EXTEND CIRCUIT/WIRING TO NEW ELECTRICAL EQUIPMENT/DEVICE.

### GENERAL NOTES:

- DOTTED SYMBOLS INDICATE EXISTING ELECTRICAL EQUIPMENT.
- REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION.
- ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THE CONTINUITY OF ALL EXISTING CIRCUITS WHICH ARE REMAINING.

## SHEET LIST

SHEET NUMBER	SHEET NAME
E0.0	SYMBOL LIST, NOTES & ABBREVIATIONS
E1.0	DEMOLITION AND NEW FLOOR PLANS - LIGHTING
E2.0	DEMOLITION AND NEW FLOOR PLANS - POWER & SYSTEMS
E3.0	DEMOLITION AND NEW FLOOR PLANS - FIRE ALARM
E4.0	FIRE ALARM RISER DIAGRAM
E5.0	ELECTRICAL SCHEDULES
E6.0	ELECTRICAL DETAILS



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# PAWTUCKET CITY HALL

FIRE DEPARTMENT RESCUE ROOM & KITCHEN RENOVATIONS

137 ROOSEVELT AVENUE  
PAWTUCKET, RI 02860

SCALE **N.T.S.**  
DATE **04-29-2022**  
DRAWN BY **NG**  
REVIEWED BY **SC**  
JOB NO. **21-272**

DRAWING NAME  
**ELECTRICAL LEGEND, NOTES & ABBREVIATIONS**

DRAWING NO.

# E0.0

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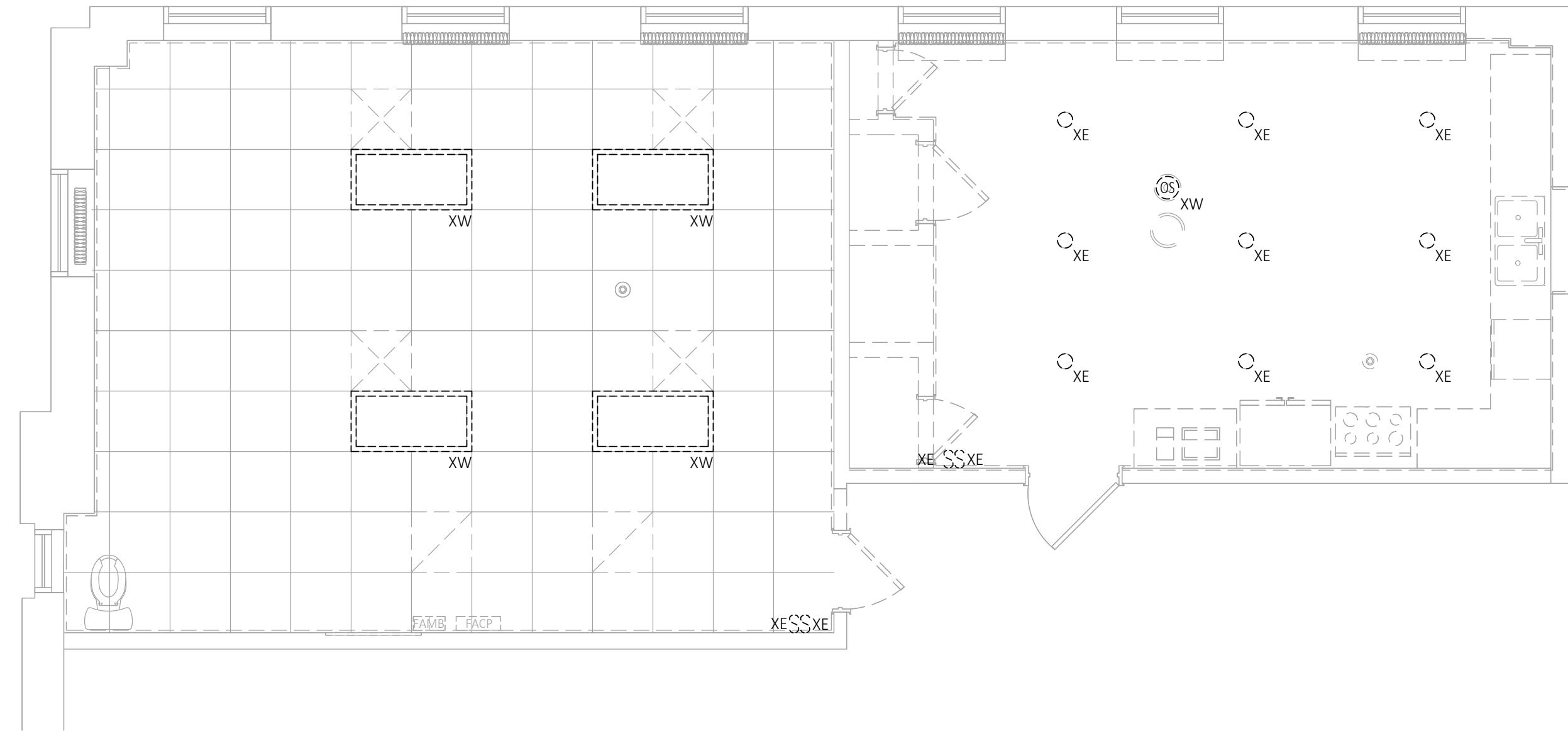
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GENERAL SHEET NOTES

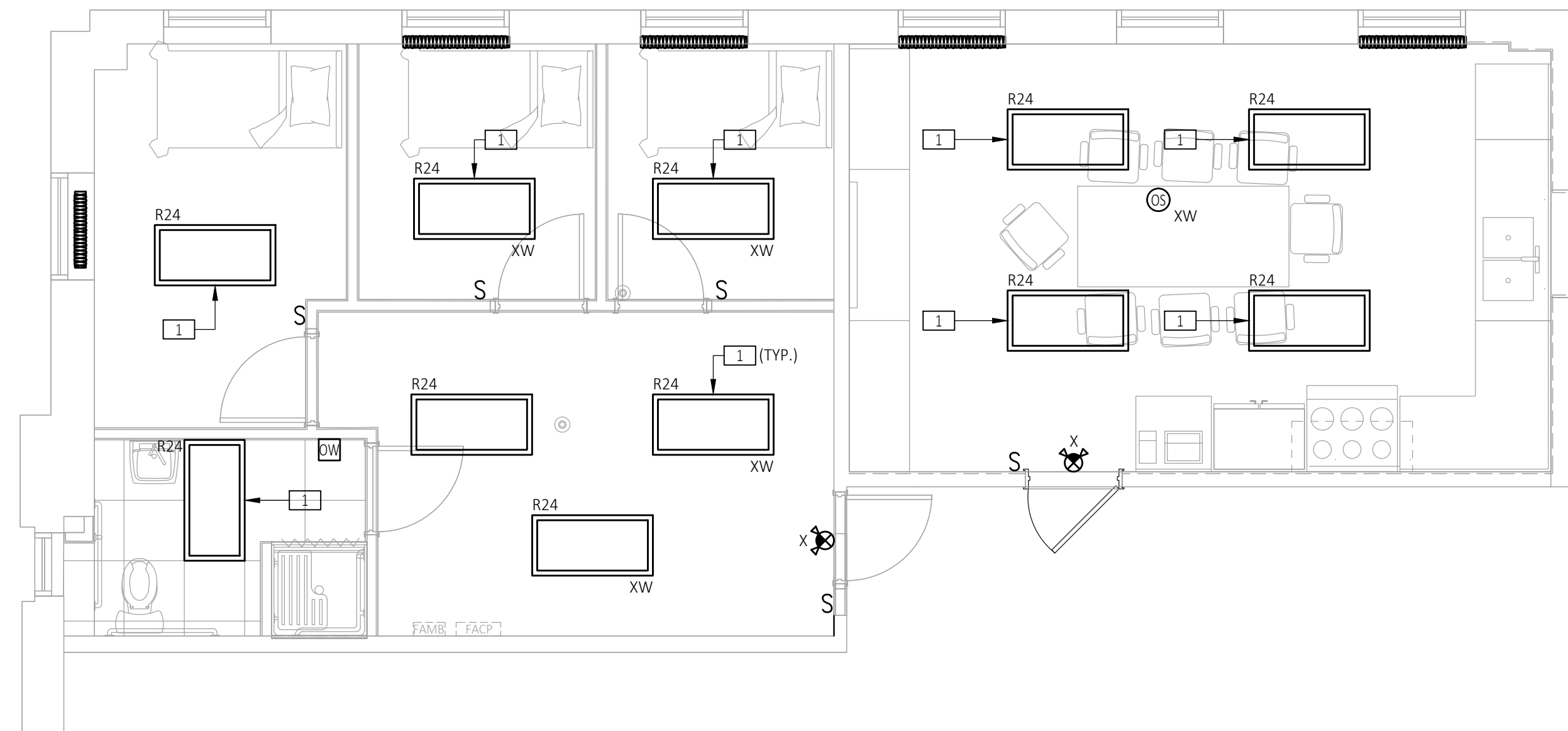
- EXACT LOCATIONS OF ALL FIXTURES AND DEVICES SHALL BE FULLY COORDINATED WITH ARCHITECTURAL PLANS, ELEVATIONS, SECTIONS, AND THE WORK OF OTHER TRADES PRIOR TO ROUGH-IN.
- WIRING AND CONDUIT OR MC CABLE SHALL BE REQUIRED BETWEEN ALL LIGHTING FIXTURES, SWITCHES, SENSORS, POWER PACKS, RELAYS, AND OTHER AUXILIARY DEVICES. WIRING AND CONDUIT OR MC CABLE IS SHOWN ON DRAWINGS ONLY FOR SPECIFIC ROUTES OR SPECIAL CONDITIONS. IT IS THE INTENT OF THESE DOCUMENTS THAT A COMPLETE BRANCH CIRCUIT AND CONTROL WIRING SYSTEM BE INSTALLED.
- ALL BRANCH CIRCUIT CONDUCTORS SHALL BE 98% CONDUCTIVITY, COPPER MINIMUM #12 AWG SIZE, THWN/THHN INSULATION, 600 VOLTS RATED UNLESS OTHERWISE NOTED.
- METAL ROOF DECKS SHALL NOT BE TAPPED FOR SUPPORT OF ANY LIGHTING FIXTURES OR ELECTRICAL EQUIPMENT. PROVIDE UNISTRUT OR OTHER SUPPLEMENTAL SUPPORT FITTINGS TO BE ATTACHED TO BUILDING STRUCTURAL FRAMING AS REQUIRED FOR SUPPORT OF ALL LIGHTING FIXTURES AND ELECTRICAL EQUIPMENT.
- LOCATIONS OF ALL SWITCHES SHALL COMPLY WITH ADA CRITERIA.
- REFER TO ARCHITECTURAL DRAWINGS FOR FIRE AND SMOKE RATED WALLS AND PROVIDE PROPER METHOD OF PENETRATION FOR EACH.
- PROVIDE DEDICATED CIRCUIT FOR EXIT SIGNS.

KEYED SHEET NOTES

- 1 E.C. SHALL EXTEND EXISTING LIGHTING CIRCUIT SERVING THE AREA TO FEED NEW FIXTURES.



1 DEMOLITION FLOOR PLAN - LIGHTING  
SCALE: 1/4" = 1'-0"  
0 4'-0" 8'-0" 12'-0" N



2 NEW CEILING PLAN - LIGHTING  
SCALE: 1/4" = 1'-0"  
0 4'-0" 8'-0" 12'-0" N

PAWTUCKET CITY HALL  
FIRE DEPARTMENT RESCUE ROOM & KITCHEN RENOVATIONS

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SCALE 1/4" = 1'-0"  
DATE 04-29-2022  
DRAWN BY NG  
REVIEWED BY SC  
JOB NO. 21-272

DRAWING NAME  
**ELECTRICAL LIGHTING DEMOLITION AND NEW WORK PLAN**

DRAWING NO.

**E1.0**

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### GENERAL SHEET NOTES

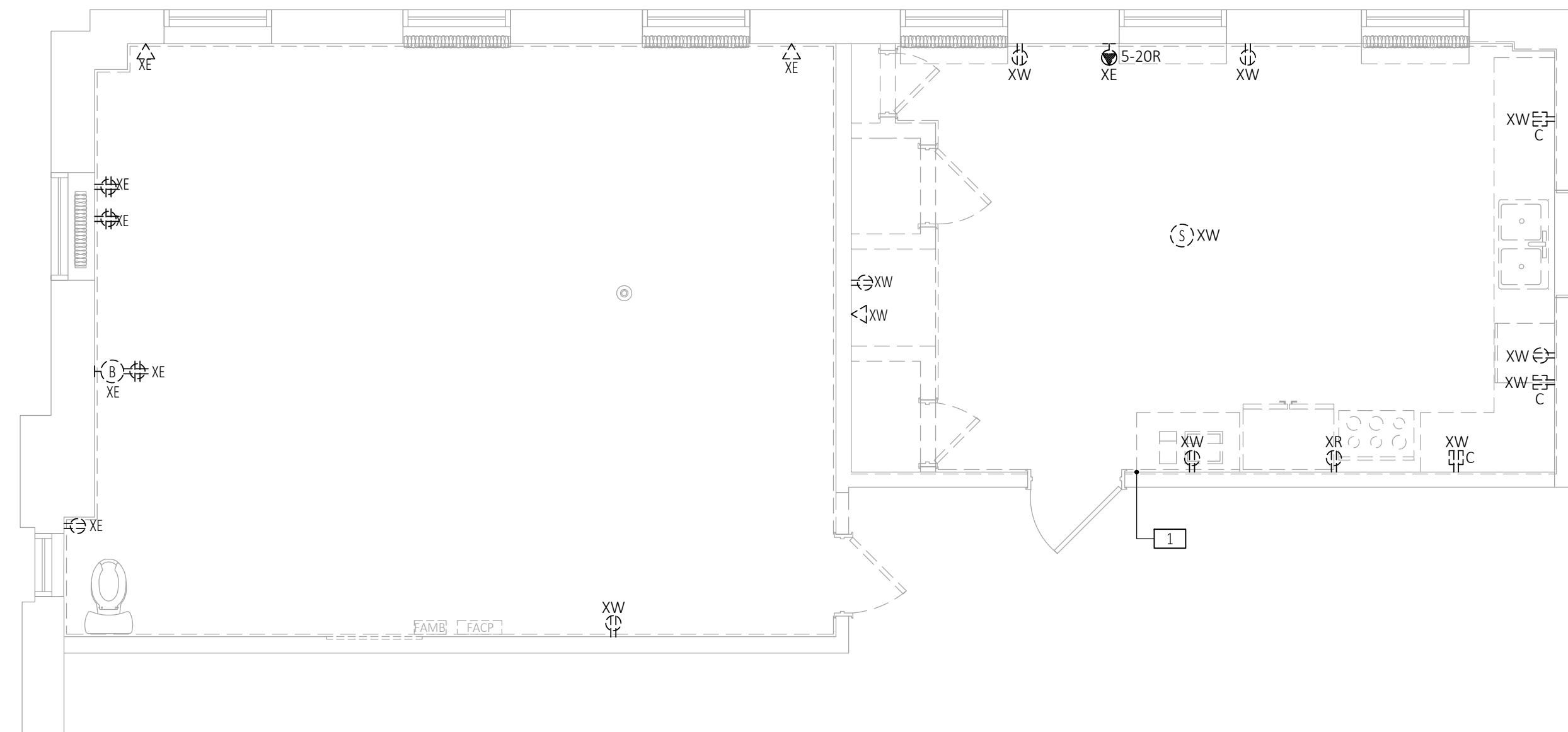
- ALL BRANCH CIRCUIT CONDUCTORS SHALL BE TYPE MC 98% CONDUCTIVITY, COPPER MINIMUM #12 AWG SIZE THWN/THHN INSULATION, 600 VOLTS RATED UNLESS OTHERWISE NOTED.
- COORDINATE EXACT LOCATION OF ALL DEVICES.
- WIRING IS SHOWN ON DRAWINGS ONLY FOR SPECIFIC ROUTES OR SPECIAL CONDITIONS.
- WIRING AND CONDUIT SHALL BE REQUIRED BETWEEN ALL OUTLETS INDICATED WITH CIRCUIT NUMBERS AND PANEL DESIGNATIONS.
- ALTHOUGH ALL BRANCH CIRCUIT WIRE AND CONDUIT IS NOT SHOWN, IT IS THE INTENT OF THESE DOCUMENTS THAT A COMPLETE BRANCH CIRCUIT WIRING SYSTEM BE INSTALLED.
- TYPICALLY REFER TO ARCHITECTURAL ELEVATIONS FOR DEVICE LOCATIONS PRIOR TO ROUGH-IN.
- COORDINATE MOUNTING HEIGHT OF ALL TECHNOLOGY DEVICES WITH TECHNOLOGY CONTRACTOR PRIOR TO ROUGH-IN.
- REFER TO ARCHITECTURAL DRAWINGS FOR FIRE AND SMOKE RATED WALLS AND PROVIDE PROPER METHOD OF PENETRATION FOR EACH.

### MECHANICAL CONNECTION SCHEDULE TAG

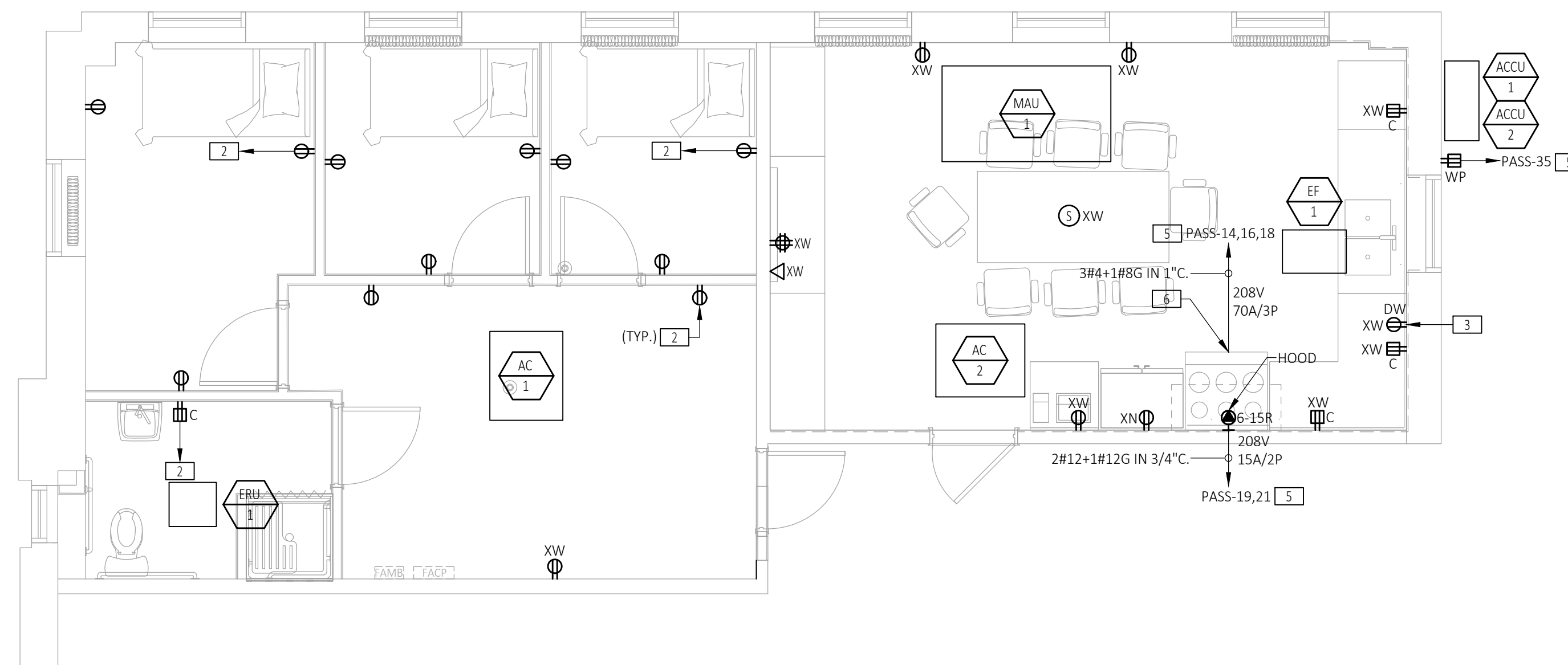
REFER TO "ELECTRICAL CONNECTION SCHEDULE FOR MECHANICAL EQUIPMENT" IN THIS DRAWING SET FOR ALL CIRCUIT INFORMATION, INCLUDING BUT NOT LIMITED TO BRANCH CIRCUIT WIRING AND CONDUIT SIZE, VOLTAGE, PHASE, MOTOR CONTROL, DISCONNECT SWITCH AND CIRCUIT BREAKER. REFER TO MECHANICAL, PLUMBING, AND FIRE PROTECTION PLANS FOR EXACT EQUIPMENT LOCATIONS.

### KEYED SHEET NOTES

- EXISTING SPEAKER / RADIO SYSTEM TO REMAIN.
- UTILIZE CIRCUITS MADE AVAILABLE THROUGH THE COURSE OF DEMOLITION TO FEED NEW DEVICES. EXTEND WIRING AS REQUIRED FOR A COMPLETE INSTALLATION.
- E.C. SHALL ENSURE RECEPTACLE SERVING DISHWASHER IS GFCI PROTECTED. PROVIDE GFCI CIRCUIT BREAKER.
- E.C. SHALL REPLACE WITH NEW RECEPTACLE AFTER RELOCATING CIRCUIT AS INDICATED.
- CIRCUIT TO PANEL LABELED "PASS" IN BASEMENT. PROVIDE UPDATED TYPED PANELBOARD DIRECTORY. E.C. SHALL FIELD VERIFY EXISTING PANELBOARD HAS SPARE CAPACITY FOR NEW LOADS.
- RANGE SHALL HAVE HARD WIRED CONNECTION. CONFIRM EXACT REQUIREMENTS WITH OWNER'S VENDOR. WIRE PER MANUFACTURER'S RECOMMENDATIONS.



1 DEMOLITION FLOOR PLAN - POWER & SYSTEMS  
SCALE: 1/4" = 1'-0"



2 NEW FLOOR PLAN - POWER & SYSTEMS  
SCALE: 1/4" = 1'-0"

PAWTUCKET CITY HALL  
FIRE DEPARTMENT RESCUE ROOM & KITCHEN RENOVATIONS

137 ROOSEVELT AVENUE  
PAWTUCKET, RI 02860

SCALE 1/4" = 1'-0"  
DATE 04-29-2022  
DRAWN BY NG  
REVIEWED BY SC  
JOB NO. 21-272

DRAWING NAME  
**ELECTRICAL POWER DEMOLITION AND NEW WORK PLAN**

DRAWING NO.

**E2.0**

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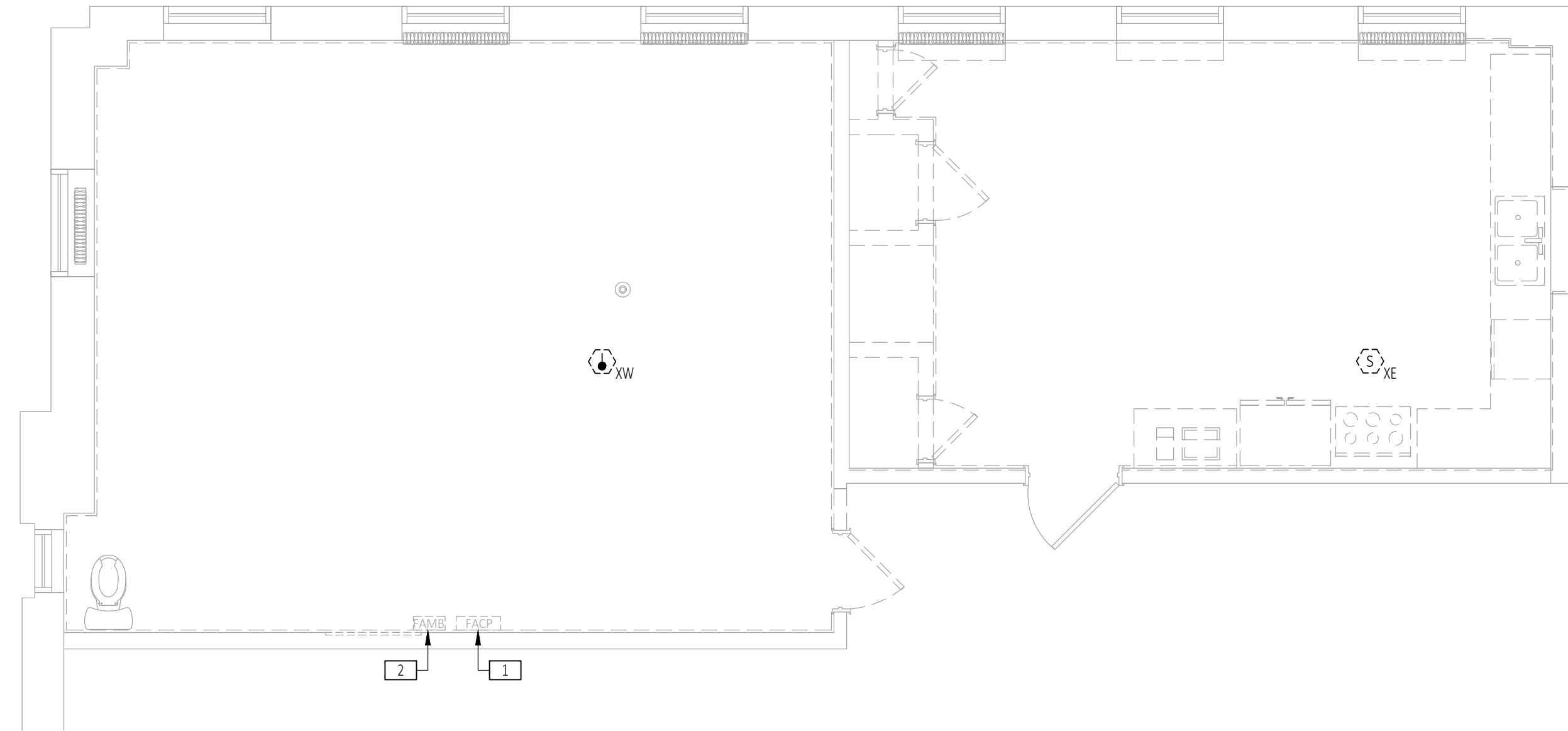
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GENERAL SHEET NOTES

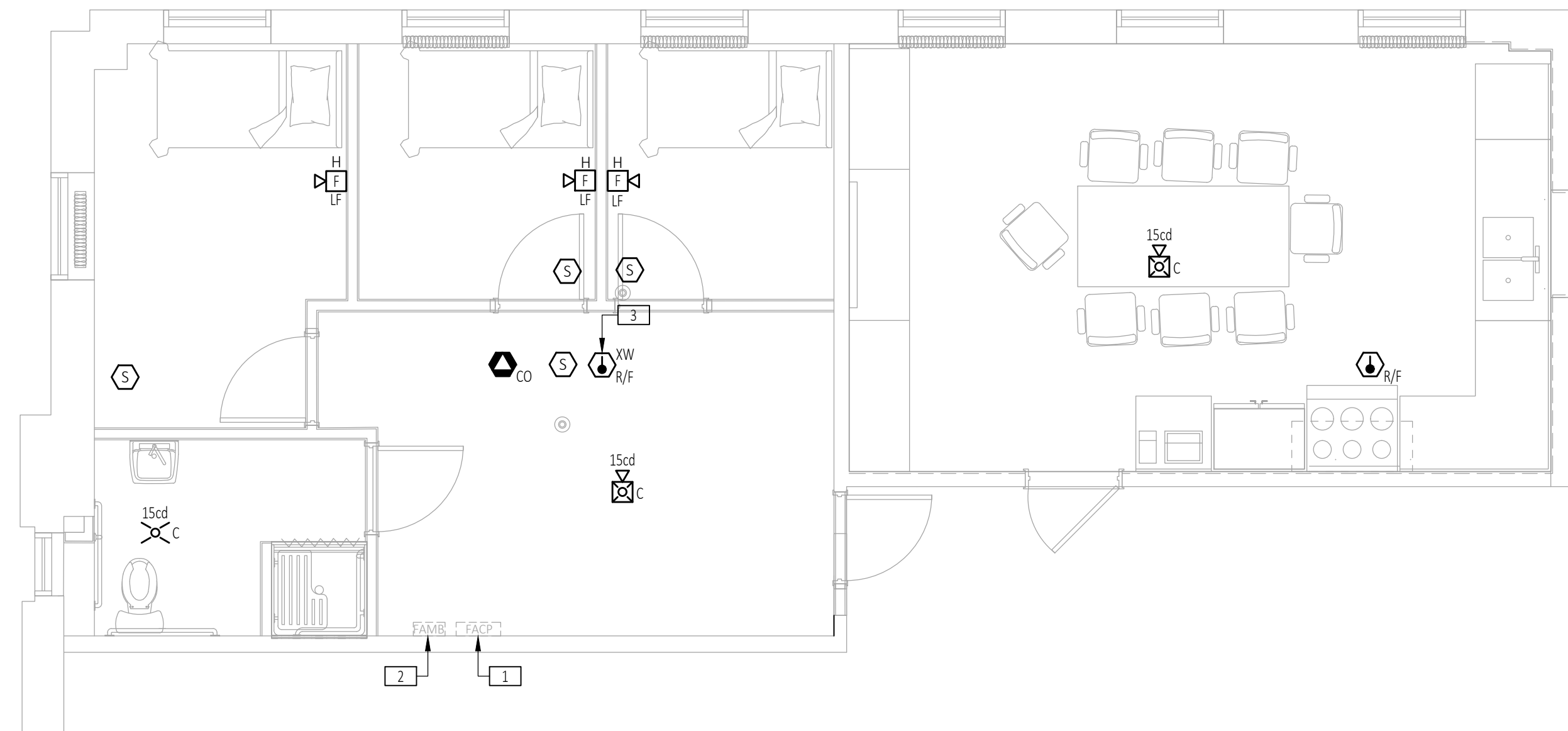
1. E.C. SHALL REFER TO SPECIFICATIONS AND DRAWINGS FOR QUANTITY OF DEVICES, SPARE CAPACITY, PARTS, ETC.
2. E.C. SHALL REFER TO HVAC DRAWINGS FOR EXACT LOCATION OF HVAC UNITS AND FOR LOCATIONS OF DUCT MOUNTED SMOKE DETECTORS. DUCT DETECTORS FURNISHED AND WIRED BY E.C.; INSTALLED BY HVAC.
3. PROVIDE EACH FIRE ALARM TERMINAL CABINET AND FIRE ALARM CONTROL PANEL WITH AN ADA POWER SUPPLY TO SERVE ALL HORN/STROBE UNITS.
4. TYPICALLY FIRE ALARM SYSTEM POWER CONDUCTORS SHALL BE #14 AWG, TYPE THHN SOLID. ALL WIRING SHALL BE INSTALLED IN CONDUIT OR SURFACE METAL RACEWAY. MC CABLE IS ALLOWED WHERE CONCEALED & ALLOWED BY CODE.
5. TYPICALLY ALL HORN/STROBE UNITS SHALL BE WIRED IN A FASHION THAT THE HORN AND THE STROBE CAN BE SILENCED SIMULTANEOUSLY.
6. TYPICALLY REFER TO DOOR HARDWARE, SCHEDULES & DRAWINGS FOR LOCATIONS & QUANTITIES OF HARDWARE EQUIPMENT AFFECTING THIS SECTION. PROVIDE ALL WORK AS REQUIRED.
7. REFER TO ARCHITECTURAL DRAWINGS FOR FIRE AND SMOKE RATED WALLS AND PROVIDE PROPER METHOD OF PENETRATION FOR EACH.

KEYED SHEET NOTES

- 1 EXISTING FIRE ALARM CONTROL PANEL TO REMAIN.
- 2 EXISTING FIRE ALARM RADIO BOX TO REMAIN.
- 3 MOUNTED ABOVE ACT CEILING.



1 DEMOLITION FLOOR PLAN - FIRE ALARM  
SCALE: 1/4" = 1'-0"  
0 4'-0" 8'-0" 12'-0" N



2 NEW FLOOR PLAN - FIRE ALARM  
SCALE: 1/4" = 1'-0"  
0 4'-0" 8'-0" 12'-0" N

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FIRE DEPARTMENT RESCUE ROOM & KITCHEN RENOVATIONS

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DATE 04-29-2022  
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DRAWING NAME  
**ELECTRICAL FIRE ALARM DEMOLITION AND NEW WORK PLAN**

DRAWING NO.

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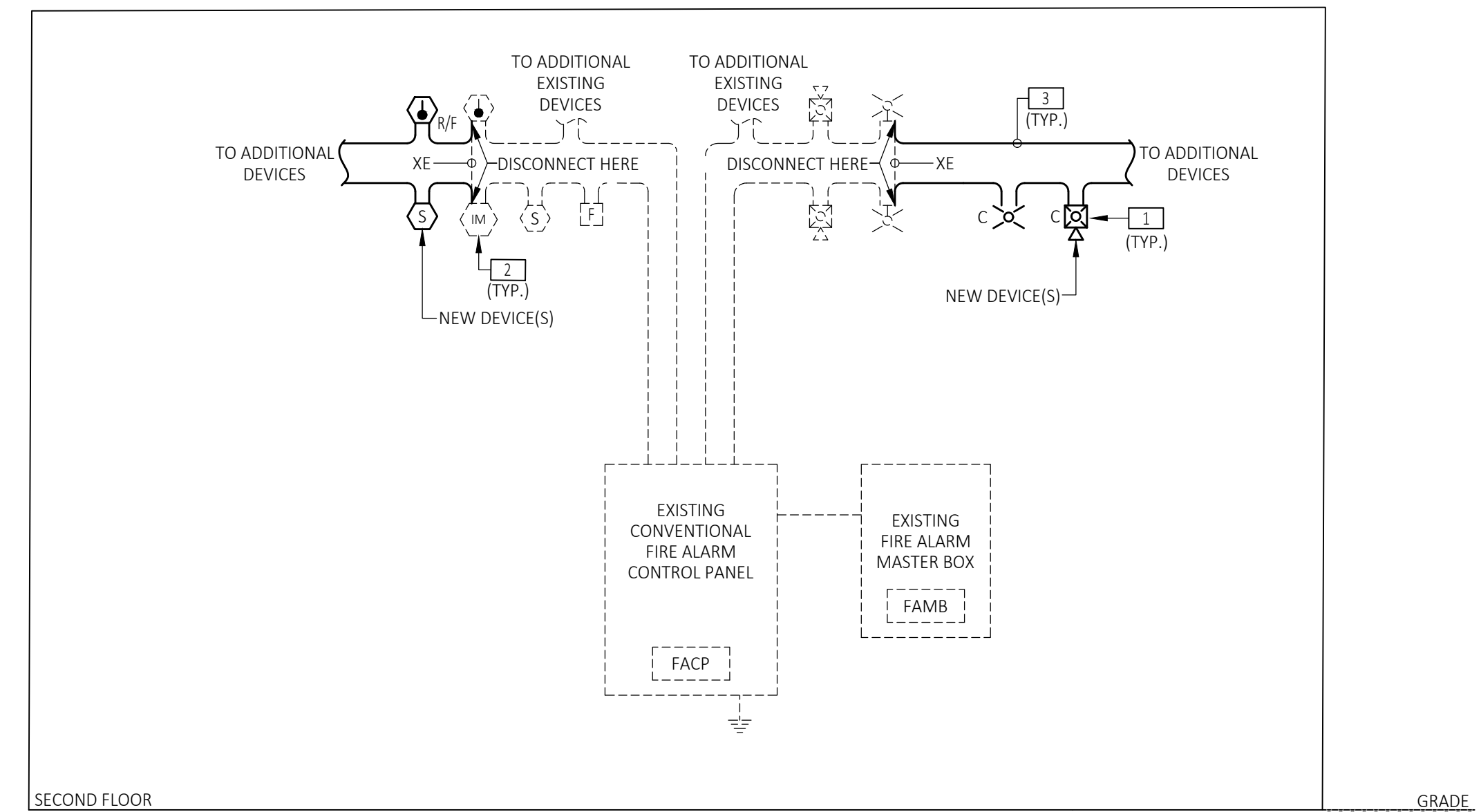
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**KEYED NOTES:**

- 1 ALL STROBES SHALL BE SYNCHRONIZED. EXACT METHOD FOR SYNCHRONIZATION SHALL BE SPECIFIC TO EACH FIRE ALARM MANUFACTURER. PROVIDE EVIDENCE OF SYNCHRONIZATION IN FIRE ALARM SUBMITTAL.
- 2 INSTALLED EVERY 25 DEVICES AND AT THE BEGINNING OF THE INITIATING LOOP.
- 3 NEW SLC WIRING SHALL MATCH EXISTING. ALL WIRING SHALL BE PER MANUFACTURER'S RECOMMENDATIONS.

**FIRE ALARM SYSTEM GENERAL NOTES:**

- 1. ALL WIRING SHALL BE PER MANUFACTURER'S SPECIFICATIONS.
- 2. THIS SCHEMATIC IS TYPICAL. WIRE TO ALL DEVICES ON ALL LOOPS AND CIRCUITS. SEE PLAN VIEWS FOR TYPES AND QUANTITIES OF DEVICES.
- 3. ALL FIRE ALARM WIRING SHALL BE RUN CONTINUOUS FROM DEVICE TO DEVICE.
- 4. OUTGOING AND RETURN CONDUCTORS MUST BE RUN IN SEPARATE RACEWAYS. PROVIDE MINIMUM SEPARATION OF 1 FOOT WHERE THE CABLE IS RUN VERTICALLY AND A 4 FEET SEPARATION WHERE THE CABLE IS RUN HORIZONTALLY. (SEE NFPA AND LOCAL CODES).
- 5. PROVIDE ANY ADDITIONAL REMOTE POWER SUPPLIES AS NECESSARY. PROVIDE ADDITIONAL SMOKE DETECTORS AS NECESSARY PER NFPA.
- 6. PROVIDE INTERMEDIATE RELAYS AS NEEDED.
- 7. SYNCHRONIZE ALL STROBE LIGHTS.
- 8. VERIFY WIRING TYPE FOR INITIATING LOOP.
- 9. VERIFY ADDITIONAL WIRING (e.g. 24V POWER FOR MODULES) WITH SPECIFIED MANUFACTURER.
- 10. PROVIDE NEW FIRE ALARM POWER SUPPLIES, AMPLIFIERS, DEVICES, WIRING, ETC. AS REQUIRED TO SERVE NEW FIRE ALARM NOTIFICATION DEVICES SHOWN ON THE DRAWINGS.
- 11. PROVIDE ISOLATION MODULES AS REQUIRED IN ACCORDANCE WITH THE RHODE ISLAND STATE FIRE CODES. PROVIDE A MINIMUM OF ONE PER FLOOR. PROVIDE AN ISOLATION MODULE FOR EVERY 25 INITIATING DEVICES.
- 12. PROVIDE 25% SPARE CAPACITY ON INITIATIONS AND NOTIFICATIONS LOOPS.
- 13. ALL FIRE ALARM EQUIPMENT INCLUDING AND NOT LIMITED TO FIRE ALARM PANELS, CABINETS, ANNUNCIATOR, PULL STATIONS, ETC. SHALL BE LOCKABLE TYPE. PROVIDE KEY ALIKE LOCKABLE EQUIPMENT AS REQUIRED.
- 14. E.C. SHALL PROVIDE SUBMITTALS OF ALL NEW FIRE ALARM DEVICES, WIRING, ETC. FOR ENGINEER'S REVIEW.
- 15. E.C. SHALL PROVIDE FIRE ALARM TESTING, AND SUBMIT A FIRE ALARM RECORD OF COMPLETION FOR ENGINEER'S REVIEW.

1 PARTIAL FIRE ALARM RISER DIAGRAM  
NOT TO SCALE

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DATE **04-29-2022**  
DRAWN BY **NG**  
REVIEWED BY **SC**  
JOB NO. **21-272**

DRAWING NAME  
**ELECTRICAL RIDER DIAGRAM**

DRAWING NO.  
**E4.0**

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### LIGHTING FIXTURE SCHEDULE

**TYPICAL LIGHTING NOTES:**

1. MOUNTING ABBREVIATIONS, "G" = RECESSED IN GRID, "F" = RECESSED IN FLANGE, "S" = SURFACE, "W" = WALL, "P" = PENDANT, "GR" = GROUND, "U" = UNIVERSAL, "T" = TRACK.
2. LIGHTING FIXTURES SHALL BE FURNISHED COMPLETE WITH ALL HARDWARE, HANGERS, ACCESSORIES, ETC. FOR A COMPLETE AND PROPER INSTALLATION. VERIFY ROOM SURFACE CONSTRUCTION/FINISH TYPES PRIOR TO THE RELEASE OF ANY LIGHTING FIXTURES TO ENSURE PROPER MOUNTING PROVISIONS AND FIXTURES FITTINGS. REFER TO ARCHITECTURAL DRAWINGS/ELEVATIONS.
3. VERIFY ALL LIGHTING FIXTURE MOUNTING HEIGHTS AND LOCATIONS WITH ARCHITECTURAL DRAWINGS/ELEVATIONS PRIOR TO THE START OF ROUGHING. PENDANT FIXTURES SHALL BE MINIMUM 19" FROM TOP OF FIXTURE TO CEILING UNLESS OTHERWISE NOTED.
4. ALL LED SOURCES, DRIVERS, AND CONTROLS SHALL MEET THE LATEST UTILITY CO. INCENTIVE REQUIREMENTS. REFER TO THE LATEST PROGRAM REQUIREMENTS DOCUMENTATION AND COORDINATE WITH UTILITY CO. TO ENSURE COMPLIANCE.
5. EXIT SIGNS SHALL BE TYPICALLY MOUNTED ON CEILINGS WHERE VISIBLE OR ON WALL WHERE CEILING MOUNTING IS NOT PRACTICAL. PRIOR TO ROUGHING COORDINATE WITH ARCHITECTURAL DRAWINGS/ELEVATIONS FOR SPECIFIC MOUNTING DIRECTION AND FOR LOCATION.
6. WHEN SUBMITTING TO ENGINEER FOR REVIEW THE LIGHTING FIXTURE SUBMITTALS SHALL CONSIST OF THE FOLLOWING: LIGHTING FIXTURE DRIVER CUT SHEET, LIGHTING FIXTURE LAMP/LED CUT SHEET FOR EACH FIXTURE. GROUPED CUT SHEETS WILL NOT BE ALLOWED. WHEN SUBMITTING ON LED PRODUCTS PROVIDE LIGHTING FACTS, LM-79, AND LM-80 TEST REPORTS FOR REVIEW.
7. FOR LIGHTING IN MECHANICAL ROOMS AND BACK OF HOUSE AREAS PROVIDE LIGHTING GENERALLY AS SHOWN. LIGHTING SHALL BE SHIFTED AS REQUIRED AT MECHANICAL EQUIPMENT THAT REQUIRES SPACE FOR FILTERS, ETC. MOUNT LIGHTING AT 9'-0" MAXIMUM UNLESS DUCTWORK AND PIPING CANT BE AVOIDED WHERE A FIXTURE IS NEEDED. IN THIS INSTANCE, RAISE OR LOWER THE FIXTURE AS REQUIRED. (NOT LESS THAN 7'-6"). LIGHTING IN THE MECHANICAL ROOM SHALL BE SUSPENDED BY AIRCRAFT CABLE. ALLOW (3") OF SLACK AIRCRAFT CABLE AND FEEDER AT EACH FIXTURE TO PERMIT FUTURE ADJUSTMENT. DO NOT SUPPORT LIGHT FIXTURES FROM DUCT OR PIPING. PROVIDE UNISTRUIT BELOW DUCTS WHERE FIXTURE LOCATIONS COINCIDE WITH DUCT RUNS. PROVIDE THREADED RODS FROM STRUCTURAL MEMBERS TO SUPPORT UNISTRUIT.
8. LIGHTING FIXTURE PACKAGE SUBMITTALS SHALL BE FULLY COORDINATED BETWEEN THE ELECTRICAL CONTRACTOR, LIGHTING FIXTURE REPRESENTATIVE(S), AND LIGHTING MANUFACTURERS TO ENSURE ALL PRODUCT, INSTALLATION, AND CONTROL REQUIREMENTS ARE MET PRIOR TO SUBMISSION FOR REVIEW. IT IS THE ELECTRICAL CONTRACTORS RESPONSIBILITY TO PROVIDE A PACKAGE MEETING ALL REQUIREMENTS OF THE PROJECT FOR A COMPLETE AND FULLY FUNCTIONAL LIGHTING SYSTEM.
9. UNLESS OTHERWISE INDICATED, ALL FINISHES SHALL BE SELECTED BY THE ARCHITECT FROM STANDARD FINISH OPTIONS OR RAL FINISH PALETTE (DENOTED AS \*FBA\*).

TYPE	DESCRIPTION	MANUFACTURER	MODEL / SERIES	VOLTAGE	MTG.	SOURCE							DIMMING PROTOCOL	FINISH / MATERIAL	NOTES	ALTERNATE MANUFACTURERS
						TYPE	INPUT WATTAGE	INITIAL LUMENS	LUMEN MAINTENANCE	CRI	COLOR / TEMP.					
INTERIOR FIXTURES																
R24	2' X 4' TROFFER FIXTURE	WILLIAMS	50-G-5-2-4-L59-8-35-F-AF12125-DRV-120	120	G	LED	48	6,231	L80@ >72,000HRS	80	3,500K	N/A	*FBA*	CONFIRM EXACT MODEL NUMBER WITH ARCHITECT AND LIGHTING VENDOR.	-	
EMERGENCY FIXTURES / EQUIPMENT																
X	EXIT SIGN WITH EMERGENCY REMOTE HEADS	BARRON	QCRT-R-WH	120	W	LED	2	N/A	N/A	N/A	N/A	N/A	*FBA*	CONFIRM EXACT MODEL NUMBER WITH ARCHITECT AND LIGHTING VENDOR.	-	

### BRANCH CIRCUIT PANELS SCHEDULE

**NOTES:**

1. NOTES 3 & 4 APPLY TO ALL PANEL BOARDS.
2. PROVIDE WITH LUGS TO ACCOMMODATE CONDUCTOR SIZES AS IDENTIFIED ON THE RISER DIAGRAM FOR SUPPLY AND ALL LOADS. (THIS NOTE APPLICABLE TO ALL TERMINATIONS.)
3. PANEL SHALL BE FULLY RATED UNLESS NOTE 5 REFERENCED IN THE NOTES SECTION.
4. ALL CIRCUIT BREAKERS SERVING RESIDENTIAL AREAS NOT LIMITED TO LIVING UNITS, APARTMENTS, CONDOMINIUMS, HOTEL/ MOTEL ROOMS, DORM ROOMS, ETC. SHALL BE ARC FAULT CIRCUIT INTERRUPTER (AFCI) TYPE. PROVIDE COMBO AFCI/GFCI CIRCUIT BREAKERS WHERE GFCI PROTECTION IS ALSO REQUIRED PER THE NEC.

NOTES 5-11 ARE OPTIONS WHICH SHALL BE SPECIFICALLY INDICATED IN NOTES SECTION FOR INCLUSION:

5. INTERRUPTING CAPABILITY BY UL LISTED SERIES RATED SYSTEM. PROVIDE NAMEPLATES IN ACCORDANCE WITH NEC REQUIREMENTS IDENTIFYING SERIES RATING APPLICATION.
6. PROVIDE WITH 120V SHUNT TRIP MAIN CIRCUIT BREAKER.
7. BRANCH GROUND FAULT CIRCUIT INTERRUPTER BREAKER RATED FOR 4-6 ma FOR PERSONAL PROTECTION; QTY. AND RATING IN PARENTHESIS. I.E.: 7 (4-20/1)
8. BRANCH GROUND FAULT EARTH LEAKAGE BREAKER RATED FOR 30 ma FOR EQUIPMENT PROTECTION; QTY. AND RATING IN PARENTHESIS. I.E.: 8 (2-30/1)
9. BRANCH SHUNT TRIP BREAKER (120V COIL); QTY. AND RATING IN PARENTHESIS. I.E.: 9 (3-60/1)
10. BRANCH ARC FAULT CIRCUIT INTERRUPTER BREAKER; QTY. AND RATING IN PARENTHESIS. I.E.: 10 (8-20/1)
11. PROVIDE DUAL FUNCTION AFCI/GFCI TYPE BREAKERS; TYPICAL FOR ALL LOAD CENTERS.
12. EXISTING PANEL. E.C. SHALL FIELD VERIFY THERE IS ADEQUATE SPACE TO HANDLE NEW LOADS. NEW CIRCUIT BREAKERS SHALL MATCH EXISTING.

DESIGNATION	LOCATION	MTG.	ELECTRICAL CHARACTERISTICS											TOTAL POLES	BRANCH CIRCUIT BREAKERS															NOTES							
			BUS AMPS	MAIN		VOLTAGE	PHASE	WIRE	AIC	200% NEUTRAL BUS	ISOLATED GROUND BUS	FEED THRU LUGS	SURGE PROTECTIVE DEVICE		1 POLE					2 POLE					3 POLE												
				MCB	MLO										15	20	25	30	35	40	45	50	60	15	20	25	30	35	40		45	50	60	15	20	25	30
PASS	BASEMENT	SURFACE	225	-	225	120/208	3	4	-	NO	NO	NO	NO	44	2	6	-	-	-	-	-	1	1	-	1	-	-	-	-	1	-	1	-	-	-	1	12, 1-70A/3P, 1-80A/3P

### ELECTRICAL CONNECTION SCHEDULE FOR MECHANICAL EQUIPMENT

**MECHANICAL EQUIPMENT NOTES:**

1. BRANCH CIRCUIT WIRING METHODS SHALL BE AS NOTED ON THE DRAWINGS AND/OR SPECIFICATIONS FOR THE APPLICABLE LOCATION.
2. "FLEX" DENOTES FINAL THREE FEET (MAXIMUM) OF RACEWAY SHALL BE FLEXIBLE METAL OR LIQUIDTIGHT METAL CONDUIT.
3. "CP" DENOTES FINAL CONNECTION TO BOX OR CONTROL PANEL PREWIRED TO THE EQUIPMENT.
4. "REC" PROVIDE RECEPTACLE IN THE NEMA CONFIGURATION NOTED. PROVIDE GFCI TYPE AT OUTDOOR LOCATIONS, KITCHEN AREAS, OR WITHIN 6'-0" OF A SINK.
5. "WP" INDICATES PROVIDE WEATHERPROOF INSTALLATION OF RACEWAY SYSTEM.
6. MOTOR-RATED SWITCH SHALL HAVE THERMAL OVERLOAD ELEMENTS SIZED PER THE MANUFACTURER'S RECOMMENDATIONS.
7. NOTES 8-18 ARE OPTIONS WHICH SHALL BE SPECIFICALLY NOTED IN REMARKS FOR INCLUSION.
8. DISCONNECT PROVIDED INTEGRAL (PREWIRED) TO EQUIPMENT BY OTHERS.
9. PROVIDE MOTOR STARTER. SEE COMBINATION MOTOR STARTER SCHEDULE FOR MORE INFORMATION.
10. PROVIDE VARIABLE FREQUENCY DRIVE. REFER TO VFD SCHEDULE FOR MORE INFORMATION.
11. ELECTRICAL CONTRACTOR SHALL WIRE VIA ASSOCIATED CONTROL PANEL.
12. PROVIDE 120V POWER TO LEAK DETECTION FROM NEAREST RECEPTACLE CIRCUIT AND PROVIDE LOW VOLTAGE WIRING AS REQUIRED.
13. PROVIDE 30 MA GFCI CIRCUIT BREAKER FOR HEAT TRACE APPLICATIONS.
14. ELECTRICAL CONTRACTOR SHALL WIRE EXHAUST FAN VIA LINE VOLTAGE T-STAT FURNISHED BY THE MECHANICAL CONTRACTOR.
15. ELECTRICAL CONTRACTOR SHALL PROVIDE 2#12+1#12G-3/4"C. TO AQUASTAT, FURNISHED AND INSTALLED BY THE PLUMBING CONTRACTOR.
16. DISCONNECT SHALL BE PROVIDED WITH AUXILIARY CONTACTS AND CONTROL WIRING BACK TO PERMISSIVE CONTACTS AND ASSOCIATED VFD FOR DISCONNECT POSITION INTERFACE (ON OR OFF).
17. ELECTRICAL CONTRACTOR SHALL WIRE EXHAUST FAN VIA LINE VOLTAGE VARIABLE SPEED SWITCH FURNISHED BY THE MECHANICAL CONTRACTOR AND INSTALLED AND WIRE BY THE ELECTRICAL CONTRACTOR.
18. PROVIDE WEATHERPROOF GFCI RECEPTACLE AND WEATHERPROOF LIGHT FIXTURE AT UNIT. SEE ASSOCIATED DETAIL FOR ADDITIONAL INFORMATION.
19. INDOOR UNIT POWERED FROM OUTDOOR UNIT. WIRE PER THE MANUFACTURER'S RECOMMENDATIONS . PROVIDE SERVICE SWITCH TO DISCONNECT ALL POWER AND CONTROL.

TAG#	DESCRIPTION	EQUIPMENT CHARACTERISTICS									PANEL/ CIRCUIT	CIRCUIT BREAKER SIZE	FEEDER AND CONDUIT	EQUIPMENT LOCATION	CONNECTION							NOTES	
		VOLTS	PHASE	FLA	MCA	MOCp	HP	KVA	CFM	FLEX					CP	REC.	S <sub>T</sub>	DISCONNECT SWITCH					
																		SIZE	FUSE	POLE	NEMA		WP
ACCU - 1	SPLIT SYSTEM CONDENSING UNIT (OUTDOOR UNIT)	208	3	-	11	15	-	-	-	PASS-23,25,27	15A/3P	3#12+1#12G IN 3/4"C	OUTDOORS	Y	-	-	-	30	15	3	3R	Y	-
ACCU - 2	SPLIT SYSTEM CONDENSING UNIT (OUTDOOR UNIT)	208	1	-	9.7	15	-	-	-	PASS-22,22	15A/2P	2#12+1#12G IN 3/4"C	OUTDOORS	Y	-	-	-	30	15	2	3R	Y	-
AC - 1	SPLIT SYSTEM EVAPORATING UNIT (INDOOR UNIT)	208	1	-	9.7	15	-	-	-	PASS-24,26	15A/2P	2#12+1#12G IN 3/4"C	ENTRY 101	Y	-	-	-	30	15	2	1	-	-
AC - 2	SPLIT SYSTEM EVAPORATING UNIT (INDOOR UNIT)	208	1	-	9.7	15	-	-	-	PASS-28,30	15A/2P	2#12+1#12G IN 3/4"C	KITCHEN 106	Y	-	-	-	30	15	2	1	-	-
MAU - 1	MAKEUP AIR UNIT	208	3	-	58	60	-	-	-	PASS-29,31,33	60A/3P	3#4+1#10G IN 1"C	KITCHEN 106	Y	-	-	-	60	60	3	1	-	-
EF - 1	EXHAUST FAN	120	1	-	-	-	1/2	-	750	PASS-32	20A/1P	2#12+1#12G IN 3/4"C	KITCHEN 106	Y	-	-	Y	-	-	-	-	-	-
ERU - 1	ENERGY RECOVERY UNIT	120	1	-	10	15	-	-	-	PASS-34	15A/1P	2#12+1#12G IN 3/4"C	RESTROOM 102	Y	-	-	Y	-	-	-	-	-	-



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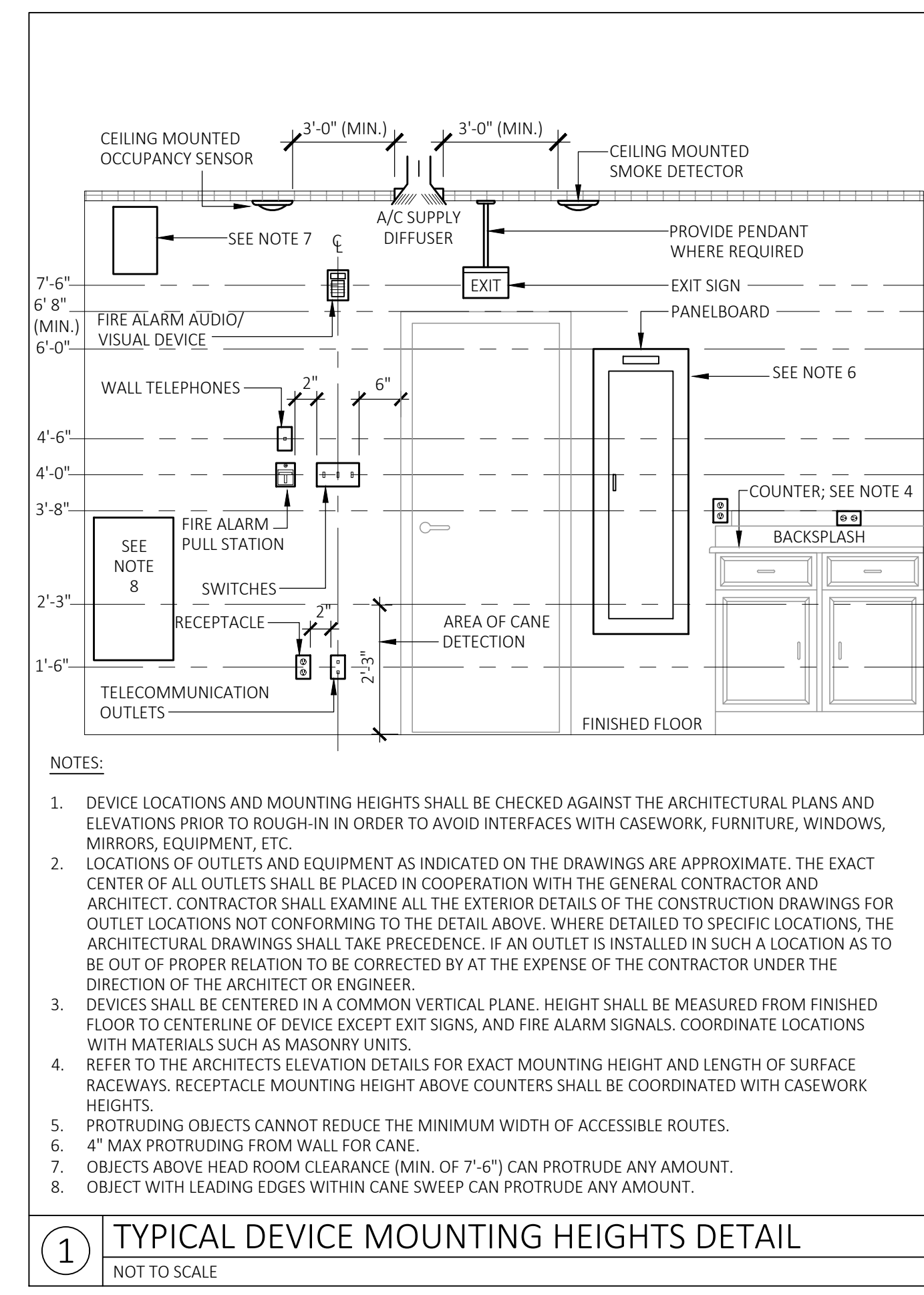
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**ELECTRICAL SCHEDULES**

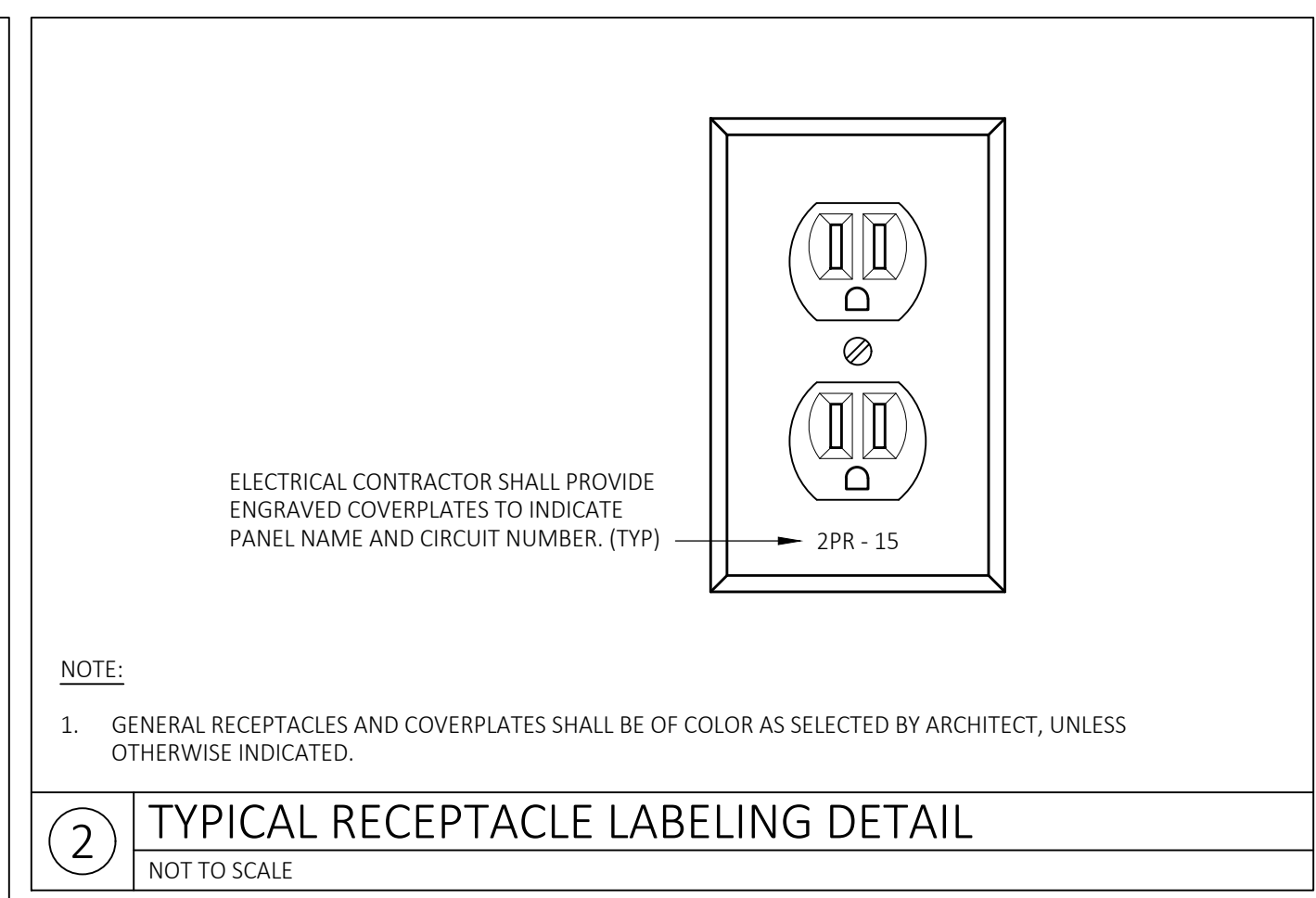
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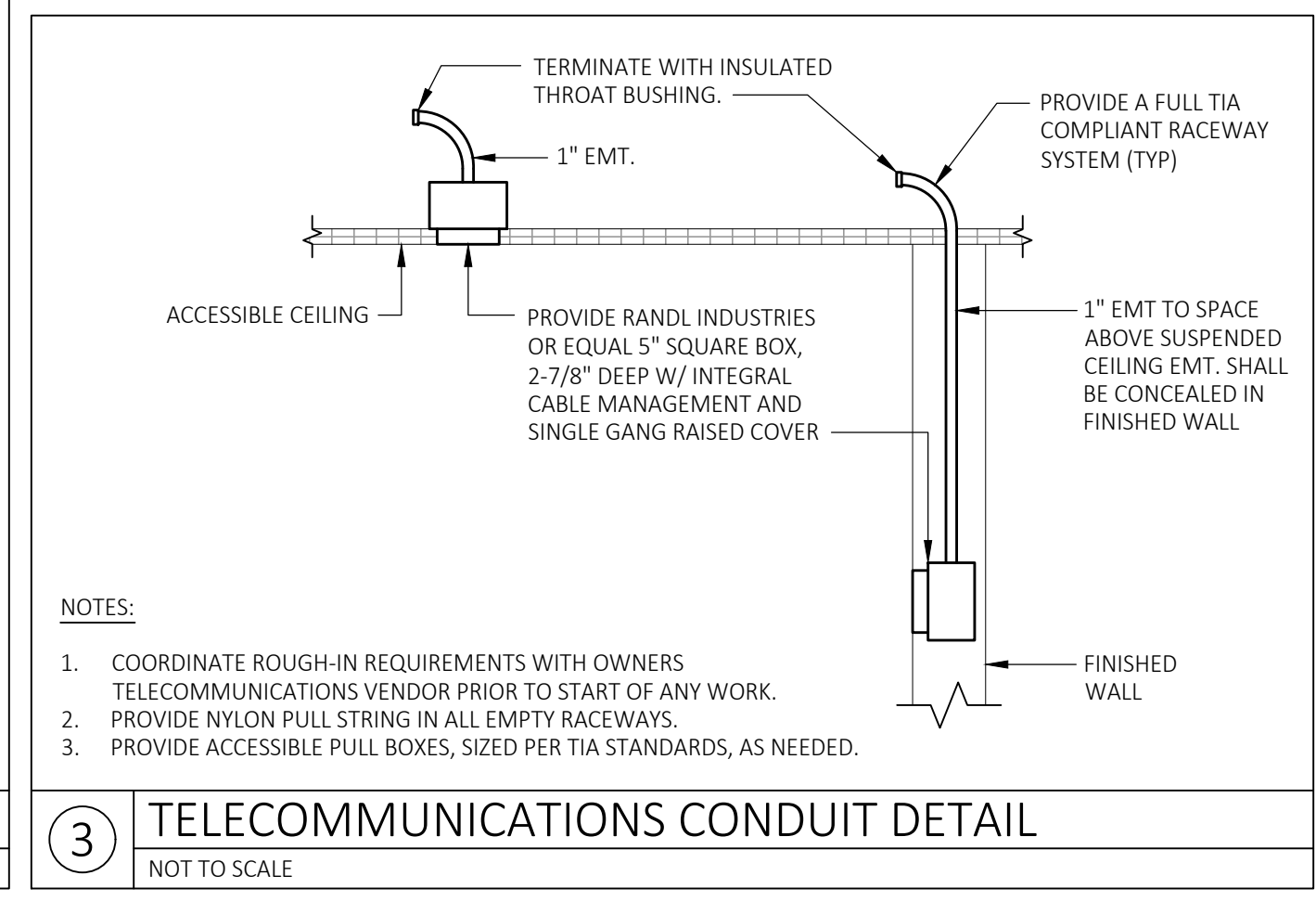
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1 TYPICAL DEVICE MOUNTING HEIGHTS DETAIL  
NOT TO SCALE



2 TYPICAL RECEPTACLE LABELING DETAIL  
NOT TO SCALE



3 TELECOMMUNICATIONS CONDUIT DETAIL  
NOT TO SCALE



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PAWTUCKET CITY HALL  
FIRE DEPARTMENT RESCUE ROOM & KITCHEN RENOVATIONS

137 ROOSEVELT AVENUE  
PAWTUCKET, RI 02860

SCALE N.T.S.  
DATE 04-29-2022  
DRAWN BY NG  
REVIEWED BY SC  
JOB NO. 21-272

DRAWING NAME  
ELECTRICAL DETAILS

DRAWING NO.

E6.0

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SYMBOL	DESCRIPTION
----	ANNOTATION TEXTS
----	PLUMBING DEMOLITION
----	PLUMBING EQUIPMENT
----	PLUMBING EXISTING
----	PLUMBING DOMESTIC COLD WATER
----	PLUMBING DOMESTIC HOT WATER
----	PLUMBING DOMESTIC HOT WATER RETURN
-----G-----G-----G-----	PLUMBING NATURAL GAS
----	PLUMBING SANITARY DRAINAGE
----	PLUMBING SANITARY DRAINAGE BELOW SLAB
----	PLUMBING SANITARY VENT
-----ST-----ST-----	PLUMBING STORM DRAINAGE
-----SST-----SST-----	PLUMBING SECONDARY STORM DRAINAGE
-----CA-----CA-----	PLUMBING COMPRESSED AIR
-----CD-----CD-----	PLUMBING CONDENSATE WASTE
(P-1)	PLUMBING FIXTURE DESIGNATION
┌	PIPE CAP
└	PIPE CONTINUATION
┌└	REDUCED PRESSURE BACKFLOW PREVENTER
○	BALL OR GATE SHUTOFF VALVE
⊕	FLOOR OR GROUND CLEANOUT; SEE SCHEDULE
⊖	CHECK VALVE
○	FLOOR DRAIN - SEE SCHEDULE
□	FLOOR SINK
▭	TRENCH DRAIN
□	ROOF DRAIN
+	CONNECT TO EXISTING
□	ACCESS PANEL
└└	CLEANOUT (STRAIGHT OR ANGLED)

SYMBOL	DESCRIPTION
┌	TEE
└	PIPE UP AND / OR RISE
┌	PIPE DROP / DOWN
└	HOSE BIBB OR PIPE STUB OUT
⊕	VACUUM BREAKER
⊖	MIXING VALVE
⊗	PRESSURE REDUCING VALVE
⊙	CIRCUIT SETTER w/ GAGE PORT
⊕	PUMP
▭	WALL SLEEVE
▭	FLOW RATE METER (IN GPM)
ABC 1	POWERED EQUIPMENT TAG
1/8"/FT	PIPE SLOPE
⊕	WATER HAMMER ARRESTOR
⊕	AIR ADMITTANCE VALVE
PH #	DETAIL CALLOUT
XX #	RISER TAG

ABBREVIATIONS			
ALL ABBREVIATIONS SHOWN ARE NOT NECESSARILY USED ON THIS PROJECT			
AFF	ABOVE FINISHED FLOOR	HZ	HERTZ
AD	ACCESS DOOR	IW	INDIRECT WASTE
AHU	AIR HANDLING UNIT	IN	INCHES
AP	ACCESS PANEL	KW	KILOWATT
ARCH	ARCHITECT	LF	LINEAR FEET
BFP	REDUCED PRESSURE	MAU	MAKE-UP AIR UNIT
BHP	BACKFLOW PREVENTER	MBH	THOUSANDS OF BTU'S PER HOUR
BLDG	BUILDING	MECH	MECHANICAL
BTU	BRITISH THERMAL UNITS	MX	MIXING VALVE
BTUH	BTU PER HOUR	N/A	NOT APPLICABLE
CFM	CUBIT FEET PER MINUTE	NC	NORMALLY CLOSED
CO	CLEANOUT	NIC	NOT IN CONTRACT
CO2	CARBON DIOXIDE	NO	NORMALLY OPEN
COP	CENTER OF PIPE	NTS	NOT TO SCALE
CTE	CONNECT TO EXISTING	OD	OUTSIDE DIAMETER
CW	COLD WATER	PC	PLUMBING CONTRACTOR
CV	CHECK VALVE	PLG	PLUMBING
DCO	DANDY CLEANOUT	PSI	POUNDS PER SQUARE INCH GA.
DIA	DIAMETER	PRV	PRESSURE REDUCING VALVE
DN	DOWN	R	RETURN
DWG	DRAWING	RE	REMOVE EXISTING
DHE	DOMESTIC WATER HEATER	RPM	REVOLUTIONS PER MINUTE
E	EXISTING	RTU	ROOF TOP UNIT
EC	ELECTRICAL CONTRACTOR	SC	SITE CONTRACTOR
EFF	EFFICIENCY	SD	STORM DRAIN
ELEC	ELECTRICAL	SF	SQUARE FEET
ELEV	ELEVATION	SQ	SQUARE
ET	EXPANSION TANK	S/S	STAINLESS STEEL
*F	DEGREES FAHRENHEIT	STL	STEEL
FCO	FLOOR CLEANOUT	S/W	SOIL/WASTE PIPE ABOVE FLOOR SLAB
FD	FLOOR DRAIN	T.B.D.	TO BE DEMOLISHED
FIA	FULL LOAD AMPS	T&P	TEMPERATURE AND PRESSURE RELIEF VALVE
FOS	FUEL OIL SUPPLY	TYP.	TYPICAL
FOR	FUEL OIL RETURN	UG	UNDER GROUND
FT	FEET	UV	ULTRAVIOLET
GAL	GALLONS	V	VENT PIPE ABOVE FLOOR SLAB
GALV	GALVANIZED	VB	VACUUM BREAKER
GC	GENERAL CONTRACTOR	VFD	VARIABLE FREQUENCY DRIVE
GCO	GRADE CLEANOUT	VTR	VENT THROUGH ROOF
GPF	GALLONS PER FLUSH	W/	WITH
GPM	GALLONS PER MINUTE	W&T	WASTE AND TRAP
HB	HOSE BIBB-SEE DETAIL	W/O	WITHOUT
HP	HORSEPOWER	WCO	WALL CLEANOUT
HVAC	HEATING, VENTILATION, AND AIR CONDITIONING	WHA	WATER HAMMER ARRESTOR
HW	HOT WATER	WH	WATER HEATER
		WMS	WIRE MESH SCREEN
		ZV	ZONE VALVE

- | GENERAL NOTES |  |
|---------------|--|
| 1.            | SCOPE OF WORK SHALL INCLUDE ALL LABOR, MATERIALS, TOOLS, EQUIPMENT, TRANSPORTATION, HOISTING, RIGGING, INSURANCE, ETC., TO PERFORM THE WORK AS INDICATED ON THE DRAWINGS AND HEREIN SPECIFIED FOR A COMPLETE INSTALLATION. ALL WORK SHALL BE IN ACCORDANCE WITH NATIONAL, STATE AND LOCAL CODES AND ORDINANCES HAVING JURISDICTION, AS INTERPRETED BY THE ARCHITECT/ENGINEER.  |
| 2.            | PLUMBING EQUIPMENT AND SUCH OTHER APPARATUS AS MAY REQUIRE MAINTENANCE AND OPERATION FROM TIME TO TIME SHALL BE MADE EASILY ACCESSIBLE. ALTHOUGH THE EQUIPMENT MAY BE SHOWN ON THE DRAWINGS IN CERTAIN LOCATIONS, THE CONSTRUCTION MAY DISCLOSE THAT SUCH LOCATIONS DO NOT MAKE ITS POSITION READILY ACCESSIBLE. IN SUCH CASES, THE OWNER OR HIS REPRESENTATIVE SHALL BE NOTIFIED BEFORE ADVANCING THE CONSTRUCTION TO A STAGE WHERE A CHANGE WILL REFLECT ADDITIONAL EXPENSE.   |
| 3.            | THE DRAWINGS SHOW THE LAYOUT OF THE PLUMBING SYSTEMS AND INDICATE THE APPROXIMATE LOCATIONS OF PIPING, BRANCHES AND ELBOWS, AND EQUIPMENT. THE RUNS AND QUANTITY OF PIPING, OFFSETS AND ELBOWS AS SHOWN ON THE DRAWINGS ARE DIAGRAMMATIC ONLY. THE EXACT ROUTING OF QUANTITY PIPING, OFFSETS AND ELBOWS SHALL BE DETERMINED BY THE STRUCTURAL CONDITIONS, POSSIBLE OBSTRUCTIONS AND COORDINATION DRAWINGS. THIS SHALL NOT BE CONSTRUED TO MEAN THAT THE DESIGN OF THE SYSTEMS MAY BE CHANGED, BUT REFERS ONLY TO EXACT ROUTING BETWEEN GIVEN POINTS. |
| 4.            | IT SHALL BE THE RESPONSIBILITY OF THE PLUMBING CONTRACTOR TO STUDY ALL DRAWINGS AND DETAILS SO THAT THE INSTALLATION OF ALL NEW WORK CAN BE FULLY COORDINATED, COORDINATE WITH ALL TRADES TO AVOID INTERFERENCE BETWEEN THE PLUMBING INSTALLATION AND THE SYSTEMS AND EQUIPMENT OF OTHER TRADES.   |
| 5.            | PLUMBING WORK IS INDICATED DIAGRAMMATICALLY. EXACT LOCATION OF ALL COMPONENTS ARE TO BE DETERMINED IN THE FIELD AND BY THE ACTUAL BUILDING CONDITIONS. EQUIPMENT OR PIPES INTERFERING WITH OTHER INSTALLATIONS SHALL BE RELOCATED AS REQUIRED AT NO ADDITIONAL COST.   |
| 6.            | PLUMBING CONTRACTOR SHALL COORDINATE ALL WALL, CEILING, FLOOR, ROOF AND BEAM PENETRATIONS WITH ARCHITECT AND STRUCTURAL ENGINEER.  |
| 7.            | PRODUCTS REQUIRED BY CONSTRUCTION BUT NOT SPECIFICALLY DESCRIBED HEREIN SHALL BE AS SELECTED BY THE CONTRACTOR SUBJECT TO THE APPROVAL OF THE A/E.   |
| 8.            | PROVIDE AND INSTALL ALL MATERIALS, LABOR, EQUIPMENT, AND ACCESSORIES FOR COMPLETE AND OPERABLE SYSTEMS AND AS REQUIRED BY THE EQUIPMENT MANUFACTURER'S INSTALLATION INSTRUCTIONS AND AS INDICATED ON THE DRAWINGS.   |
| 9.            | INSTALLATION OF THE PLUMBING SYSTEM SHALL PERMIT ACCESSIBILITY FOR SERVICE AND/OR REPLACEMENT OF EQUIPMENT.  |
| 10.           | PROVIDE ACCESS PANELS FOR ALL CLEANOUTS, VALVES, ALL OTHER CONCEALED ACCESSORIES REQUIRING ACCESS SUCH AS CONTROL VALVES, PRESSURE REDUCERS, WATER HAMMER ARRESTORS, AND AT ALL OTHER LOCATIONS WHERE COMPONENTS ARE INSTALLED WITHIN TIGHT LOCATIONS REQUIRING MAINTENANCE OR ADJUSTING REGARDLESS OF WHETHER OR NOT AN ACCESS IS INDICATED ON THE FLOOR PLANS.   |
| 11.           | ALL MISCELLANEOUS STRUCTURAL SUPPORTS REQUIRED FOR PIPING EQUIPMENT INSTALLATION SHALL BE PROVIDED BY PLUMBING CONTRACTOR.   |
| 12.           | INSTALL ALL PIPING BELOW DUCTWORK UNLESS CLEARANCE CONDITION REQUIRES PIPING TO BE ABOVE.  |
| 13.           | WHERE PIPING PENETRATES ANY SMOKE AND/OR FIRE RATED PARTITIONS PROVIDE UL LISTED FIRE STOP ASSEMBLY TO MAINTAIN RATING OF ASSEMBLY. INSTALL FIRE STOPPING PER MANUFACTURER REQUIREMENTS. ALL FIRE STOPPING TO BE PROVIDED BY A UL CERTIFIED OR MANUFACTURER CERTIFIED FIRE STOPPING CONTRACTOR.  |
| 14.           | ALL CEILING MOUNTED EQUIPMENT SHALL BE INSTALLED IN SUCH A WAY THAT LIGHTS, PIPING, AND DUCTWORK DO NOT BLOCK ACCESS TO UNITS AND RELATED ACCESSORIES.   |
| 15.           | THE PLUMBING CONTRACTOR MUST COORDINATE THE COMPONENTS AND PROGRAMMING OF THEIR EQUIPMENT, VENDORS AND THEIR SUBCONTRACTORS. CONTROL SEQUENCES SHALL BE TESTED AND CORRECTED TO THE SATISFACTION OF THE OWNER AND ENGINEER.  |
| 16.           | NEW WATER, WASTE & VENT PIPING SHALL BE HYDROSTATICALLY TESTED IN ACCORDANCE WITH LOCAL PLUMBING INSPECTORS REQUIREMENTS AND AS PER THE STATE PLUMBING CODE.   |
| 17.           | ALL PLUMBING FIXTURES SHALL BE LISTED AND APPROVED WITH THE APPROPRIATE AHJ.   |
| 18.           | DETAILS ARE PROVIDED TO AID IN UNDERSTANDING. THEY DO NOT NECESSARILY ILLUSTRATE THE ONLY METHODS OF ACHIEVING CODE COMPLIANCE AND ARE NOT SUBSTITUTES FOR PRODUCT INSTALLATION MANUALS. FURTHERMORE, DETAILS ARE SHOWN FOR TYPICAL CASES AND DO NOT ILLUSTRATE EXACT FIELD CONDITIONS UNLESS INDICATED OTHERWISE.   |

SHEET NUMBER	SHEET NAME
P0.0	PLUMBING LEGEND, NOTES, AND ABBREVIATIONS
P1.0	PLUMBING DEMOLITION AND NEW WORK PLANS
P4.0	PLUMBING SCHEDULES & DETAILS



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**PAWTUCKET CITY HALL**  
FIRE DEPARTMENT RESCUE ROOM & KITCHEN RENOVATIONS

137 ROOSEVELT AVENUE  
PAWTUCKET, RI 02860

SCALE **N.T.S.**  
DATE **04-29-2022**  
DRAWN BY **NC**  
REVIEWED BY **JP**  
JOB NO. **21-272**

DRAWING NAME  
**PLUMBING LEGEND, NOTES AND ABBREVIATIONS**

DRAWING NO.

**P0.0**

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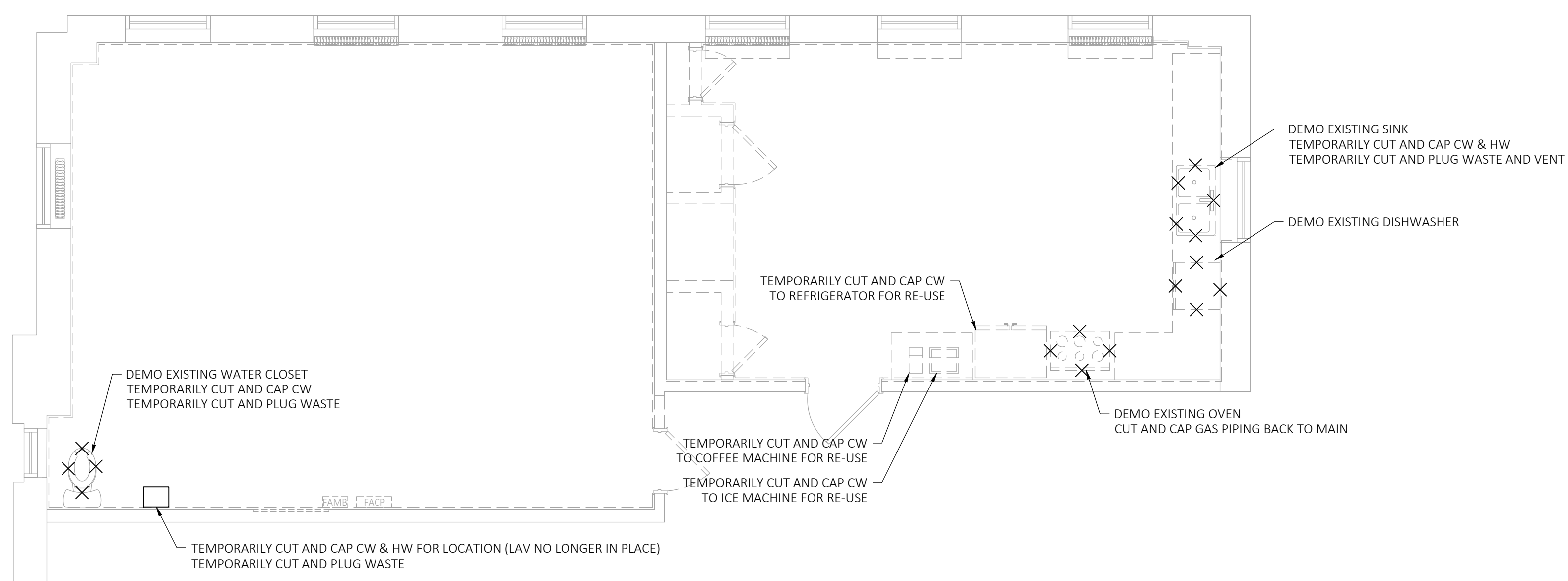
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### GENERAL SHEET NOTES

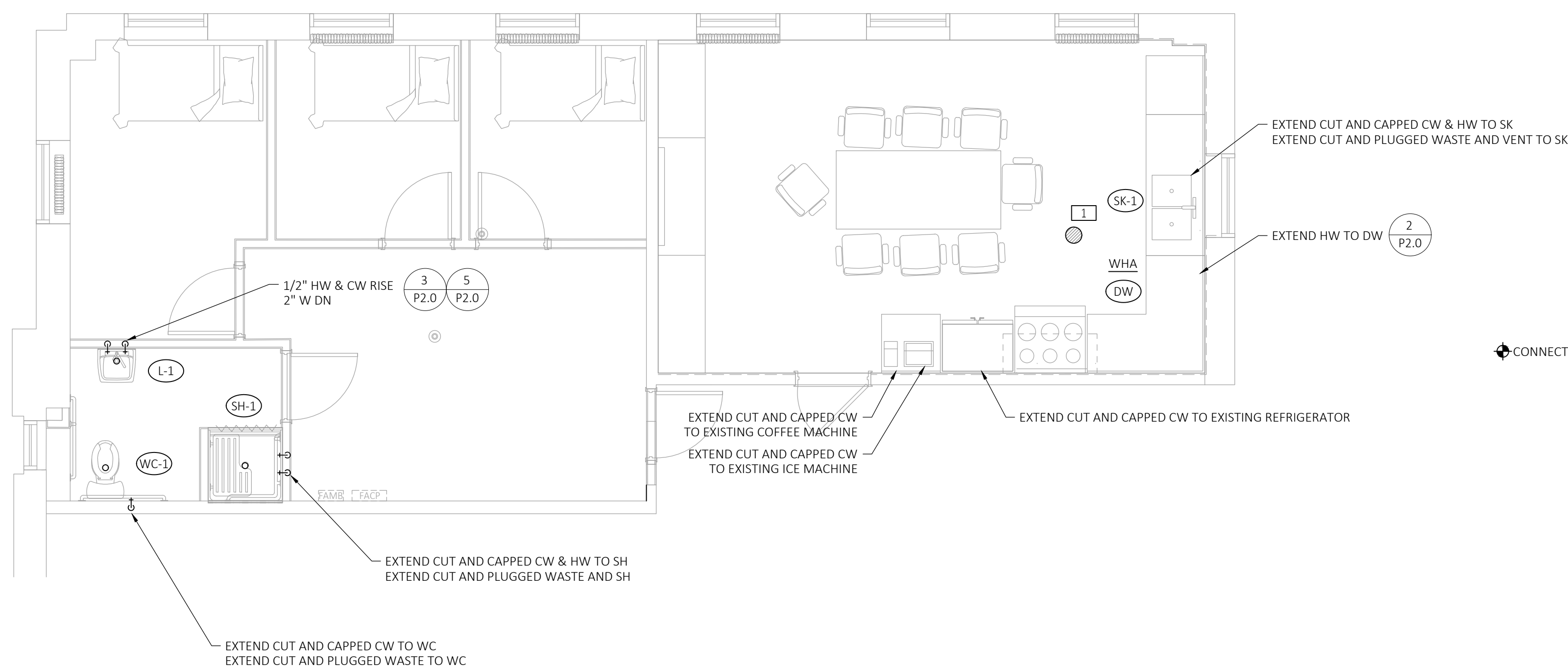
1. CONTRACTOR TO FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO START OF WORK.
2. REFER TO ARCHITECTURAL DRAWINGS.
3. NOTE THAT PLUMBING SERVICES MAY SERVE OTHER BUILDINGS, COORDINATE ANY SHUT-DOWNS WITH THE OWNER.

### KEYED SHEET NOTES

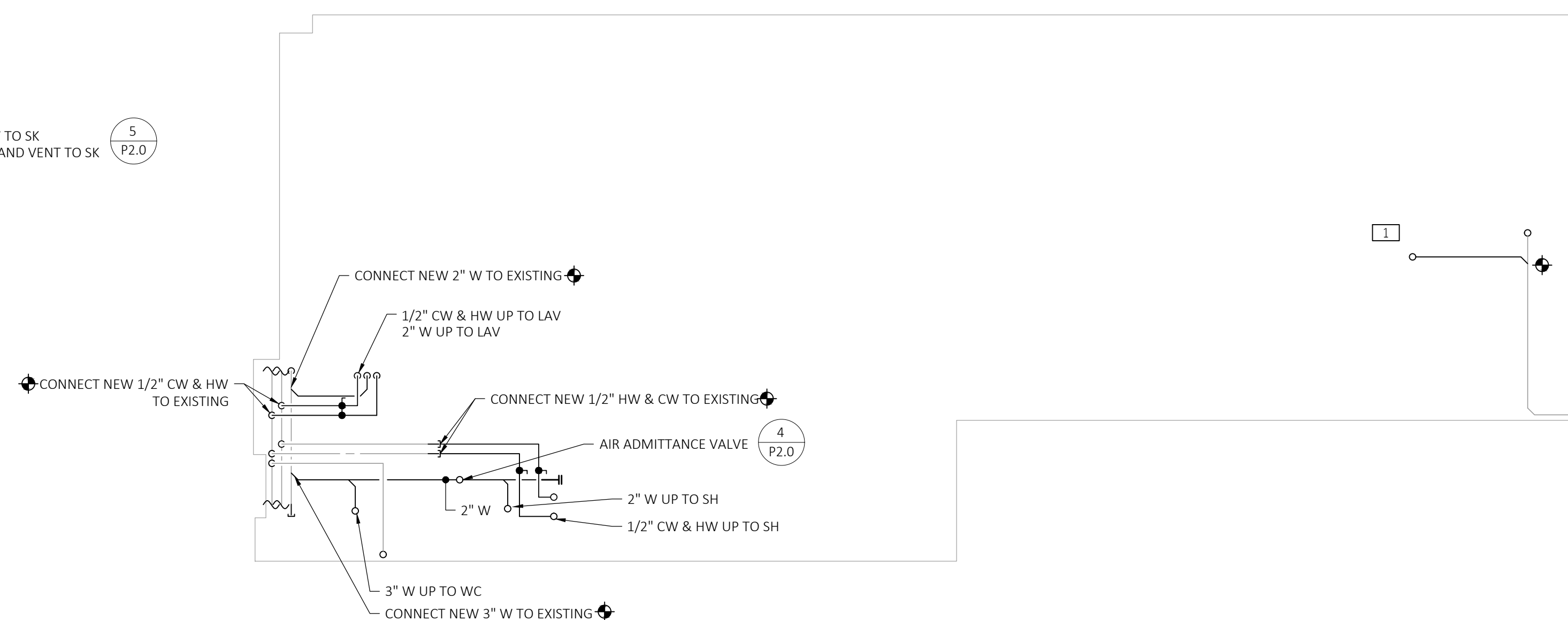
- 1 ADD ALTERNATE: INSTALL NEW FLOOR DRAIN AND CONNECT WASTE TO EXISTING WASTE IN BASEMENT



1 DEMOLITION WORK FLOOR PLAN  
SCALE: 1/4" = 1'-0"  
0 4'-0" 8'-0" 12'-0"



2 NEW WORK FLOOR PLAN  
SCALE: 1/4" = 1'-0"  
0 4'-0" 8'-0" 12'-0"



3 NEW WORK BASEMENT PLAN  
SCALE: 1/4" = 1'-0"  
0 4'-0" 8'-0" 12'-0"

## PAWTUCKET CITY HALL

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137 ROOSEVELT AVENUE  
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**PLUMBING DEMOLITION AND NEW WORK PLANS**

DRAWING NO.

# P1.0

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May 17, 2022 - 11:35am - NCampia - C:\Users\ncampia\AppData\Local\Temp\AePublish\_117161\PI.D PLUMBING DEMO & NEW PLAN.dwg



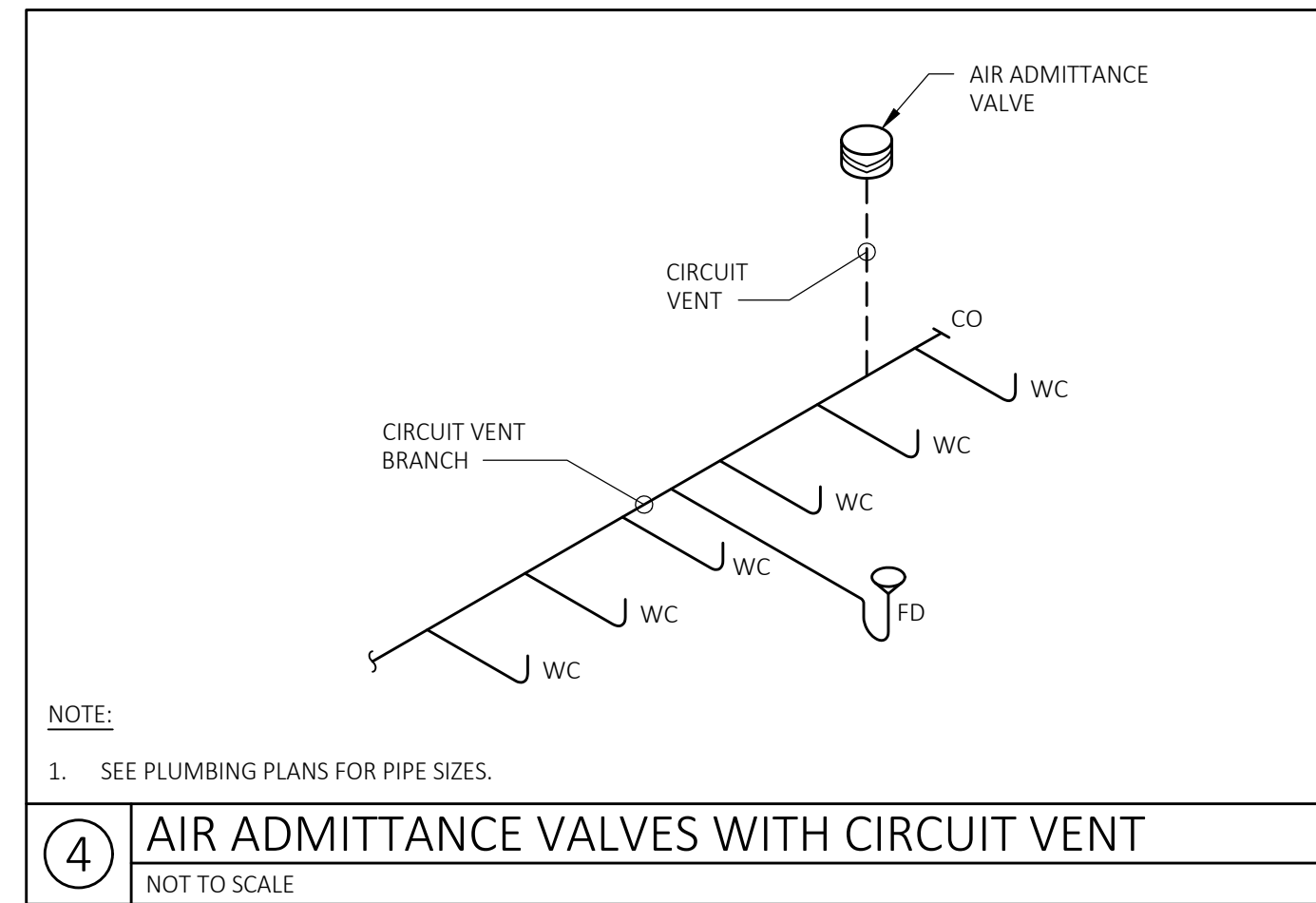
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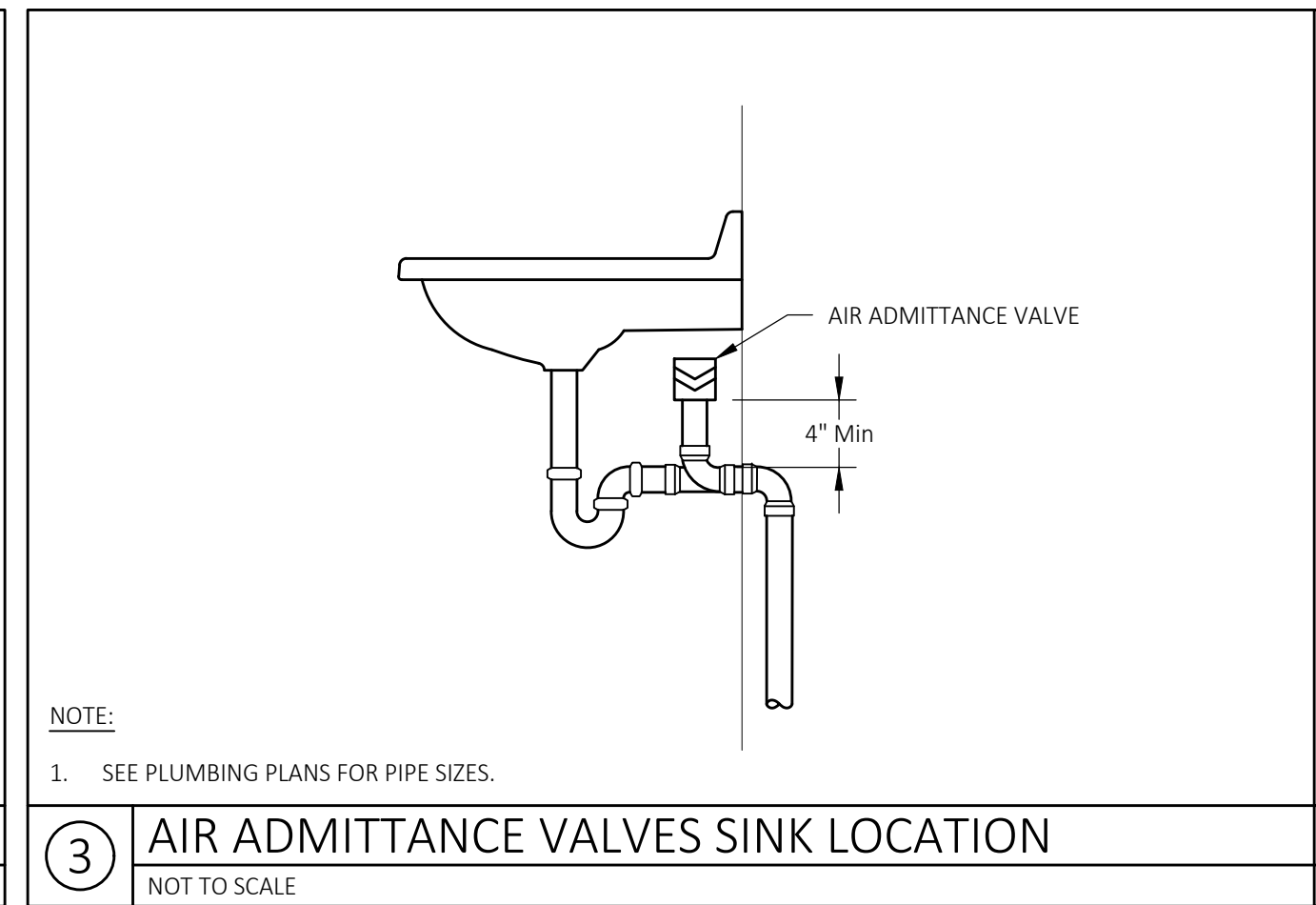
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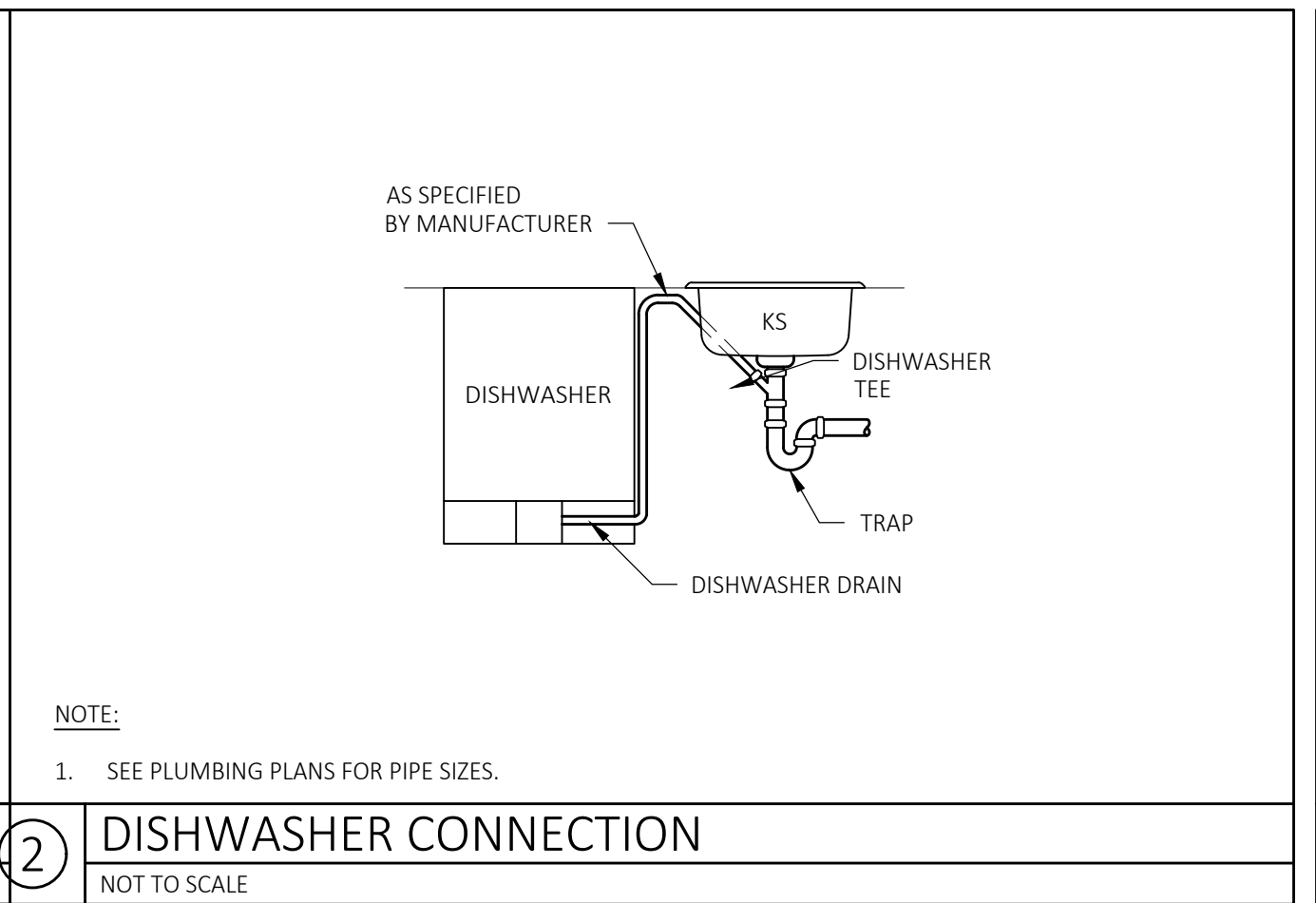
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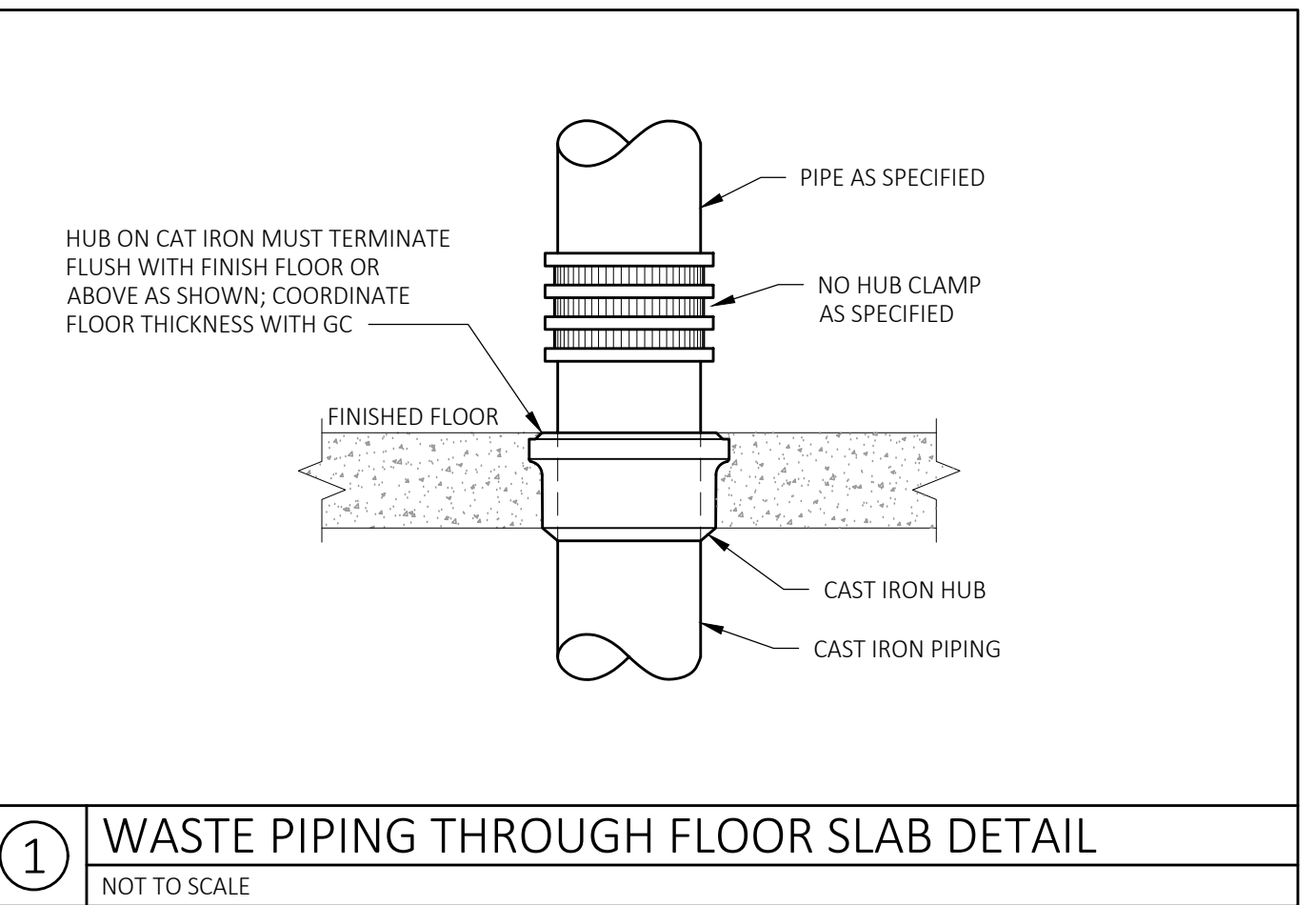
4 AIR ADMITTANCE VALVES WITH CIRCUIT VENT  
NOT TO SCALE



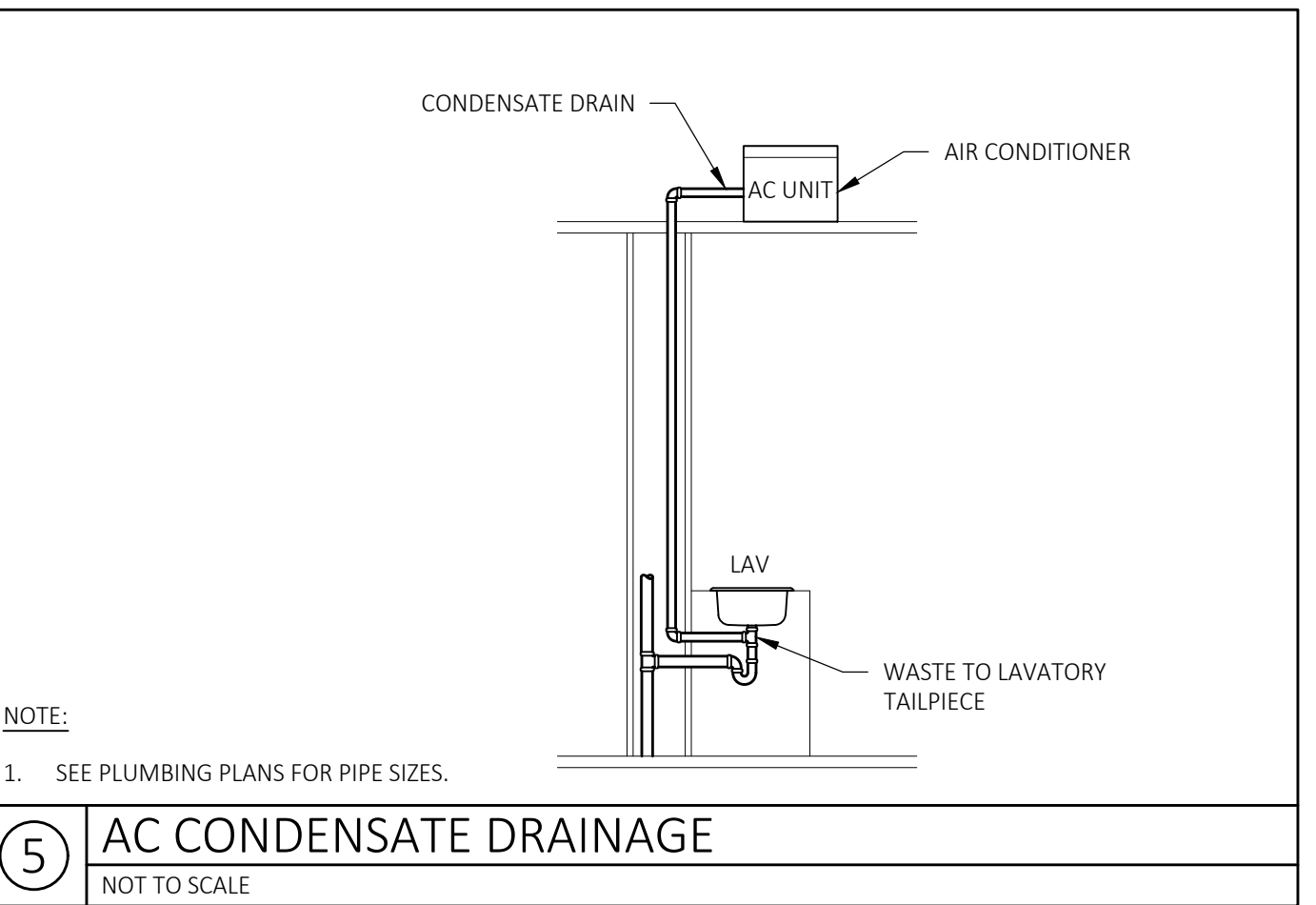
3 AIR ADMITTANCE VALVES SINK LOCATION  
NOT TO SCALE



2 DISHWASHER CONNECTION  
NOT TO SCALE



1 WASTE PIPING THROUGH FLOOR SLAB DETAIL  
NOT TO SCALE



5 AC CONDENSATE DRAINAGE  
NOT TO SCALE

DRAIN SCHEDULE			
SYMBOL	DESCRIPTION	MODEL	REMARKS
FD-1	FLOOR DRAIN	SIOUX CHIEF 832 SERIES - FINISH LINE	ADD ALTERNATE: SCH 40 HUB CONNECTION, PVC, ROUND, NICKEL-BRONZE. PROVIDE GREEN DRAIN WATERLESS TRAP SEAL.

WATER HAMMER ARRESTER			
TAG	MAKE	MODEL	DESCRIPTION
WHA	SIOUX CHIEF	652-AS	PISTON TYPE WATER HAMMER ARRESTER. SEE FLOOR PLANS FOR LOCATIONS

PLUMBING FIXTURE SCHEDULE						
TAG	FIXTURE NAME	COLD WATER	HOT WATER	WASTE	VENT	DESCRIPTION
DW	DISHWASHER	-	-	-	-	REFER TO ARCHITECTURAL DRAWINGS
L-1	LAVATORY	1/2"	1/2"	2"	1-1/2"	AMERICAN STANDARD, LUCERNE WALL-HUNG LAVATORY WITH 4" CENTERS. MODEL 0355.041. CONCEALED ARMS SUPPORT ZURN MODEL NO. Z1231. COLOR WHITE. FAUCET: AMERICAN STANDARD MONTERREY SINGLE HANDLE MANUAL FAUCET MODEL 6114.114. MEETS ADA GUIDELINES. PROVIDE THERMOSTATIC MIXING VALVE 605XTMV1070.
SH-1	SHOWER	1/2"	1/2"	2"	1-1/2"	AMERICAN STANDARD COMMERCIAL SHOWER SYSTEM TRIM KIT FOR FLASH ROUGH SHOWER VALVE. PRODUCT NUMBER: TU662.211. KIT CONTAINS DOUBLE CERAMIC PRESSURE BALANCE CARTRIDGE, VALVE TRIM KIT, 3-FUNCTION HAND SHOWER WITH NON-POSITIVE SHUT-OFF, METAL HOSE, VACUUM BREAKER, WALL SUPPLY AND 36" SLIDE BAR. 2.5 GPM. REFER TO ARCHITECTURAL DRAWINGS FOR SHOWER STALL.
SK-1	KITCHEN SINK	1/2"	1/2"	2"	1-1/2"	ADVANCE TABCO GALVANIZED WORK TABLE WITH SINK ON LEFT. MODEL KLAG-118-304L-X. FAUCET: ELKAY 4" CENTER FAUCET WITH 8" GOOSENECK. MODEL LK406GN08L2. MEETS ADA GUIDELINES.
WC-1	WATER CLOSET	1/2"	-	3"	1-1/2"	FLOOR MOUNTED, TANK WATER CLOSET. AMERICAN STANDARD, VORMAX HET RIGHT HEIGHT ELONGATED TOILET. MODEL 238AA.104. FOR TRIP METER ON RIGHT SIDE, USE MODEL 238AA.105. FLOW: 1.28 GPF. SEAT AND COVER: 5901.100

PIPING MATERIAL SCHEDULE	
DOMESTIC WATER PIPING INSIDE BUILDING ABOVE FLOOR SIZES 1/2" TO 2"	COPPER TYPE "L", WHICH SHALL CONFORM TO NSF 61 AND SHALL CONFORM TO ONE OF THE STANDARDS LISTED IN TABLE 605.4 OF THE 2018 IPC.
NATURAL GAS PIPING ABOVE GRADE	STEEL AND WROUGHT-IRON PIPE SHALL BE NOT LESS THAN STANDARD WEIGHT (SCH 40) AND SHALL COMPLY WITH ONE OF THE FOLLOWING STANDARDS: ASME B36.10,10M; ASTM A53/A53M; OR ASTM A106.
SEWER, WASTE AND VENT PIPING INSIDE BUILDING ABOVE FLOOR	PVC, WHICH CONFORMS TO ONE OF THE STANDARDS LISTED IN TABLE 702.1 OF THE 2018 IPC.
SEWER, WASTE AND VENT PIPING INSIDE BUILDING BELOW GRADE	PVC PIPE, WHICH CONFORMS TO ONE OF THE STANDARDS LISTED IN TABLE 702.2 OF THE 2018 IPC.

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**PLUMBING SCHEDULES**

DRAWING NO.

**P4.0**

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