

# **BID PROPOSAL**

**CONTRACT NO. DMVA  
42160105**

## **BID PROPOSAL INDEX**

**NOTICE TO BIDDERS**

**GENERAL INFORMATION**

**BASE BIDS**

**UNIT PRICES**

**BIDDER ORGANIZATION INFORMATION**

**CERTIFICATION AND BID SIGNATURE**

**NOTE: Please read all pages of this Bid Proposal. All pages of the Bid Proposal shall be returned and properly executed with sealed bid. Bid Proposal forms are supplied in duplicate, one to be submitted to the Department and the other for the Bidder's use and record.**





**BID PROPOSAL**

**Department of Military  
and Veterans Affairs  
Bldg. 0-47, Fort  
Indiantown Gap  
Annville, PA 17003**

*Do not write in space below*

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

Legal Review: \_\_\_\_\_

**CONTRACT NO. 42160105  
GENERAL CONSTRUCTION  
HVAC & Exhaust  
Replacement  
Lock Haven FMS  
Lock Haven, PA. 17745**

**Bidder Name and Address:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Bidder Phone #

Bidder Fax #

Bidder Email:

Bidder Federal ID#

Bidder Vendor ID#

**FLYER INFORMATION:** Bidder acknowledges receipt of the following Flyer(s) and agrees they are part of this Bid Proposal.

Flyer # \_\_\_\_\_ Issue Date: \_\_\_\_\_

Flyer # \_\_\_\_\_ Issue Date: \_\_\_\_\_

Flyer # \_\_\_\_\_ Issue Date: \_\_\_\_\_

Flyer # \_\_\_\_\_ Issue Date: \_\_\_\_\_

Flyer # \_\_\_\_\_ Issue Date: \_\_\_\_\_

Flyer # \_\_\_\_\_ Issue Date: \_\_\_\_\_

**THE BIDDER MUST TYPE/WRITE ITS TOTAL BID PRICE FOR EACH SEPARATE BASE BID ON THIS "BASE BID" SHEET. DO NOT SOLELY WRITE ANY ADDITIONAL OR DEDUCTED AMOUNT ON THE BASE BID LINE.**

**Base Bid:**

For all **GENERAL CONSTRUCTION** the sum of

\_\_\_\_\_ Dollars (\$ \_\_\_\_\_).  
(Written) (Figure)





**BID PROPOSAL**

**Department of Military and  
Veterans Affairs  
Bldg. 0-47, Fort Indiantown Gap  
Annville, PA 17003**

*Do not write in space below*

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

Legal Review: \_\_\_\_\_

**CONTRACT NO. 42160105  
HVAC  
HVAC & Exhaust Replacement  
Lock Haven FMS  
Lock Haven, PA. 17745**

**Bidder Name and Address:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Bidder Phone #

Bidder Fax #

Bidder Email:

Bidder Federal ID#

Bidder Vendor ID#

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Flyer # \_\_\_\_\_ Issue Date: \_\_\_\_\_

THE BIDDER MUST TYPE/WRITE ITS TOTAL BID PRICE FOR EACH SEPARATE BASE BID ON THIS "BASE BID" SHEET. DO NOT SOLELY WRITE ANY ADDITIONAL OR DEDUCTED AMOUNT ON THE BASE BID LINE.

**Base Bid:**

For all **HVAC** **the** sum of

\_\_\_\_\_ Dollars (\$ \_\_\_\_\_).  
(Written) (Figure)



# **BID PROPOSAL**

Department of Military and  
Veterans Affairs  
Bldg. 0-47, Fort Indiantown Gap  
Annville, PA. 17003

Do not write in space below

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

Legal Review

**CONTRACT NO. 42160105  
PLUMBING  
HVAC & Exhaust Replacement  
Lock Haven FMS  
Lock Haven, PA. 17745**

### **Bidder Name and Address:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Bidder Phone #

Bidder Fax #

Bidder Email:

Bidder Federal ID#

Bidder Vendor ID#

**FLYER INFORMATION:** Bidder acknowledges receipt of the following  
Flyer(s) and agrees they are part of this Bid Proposal.

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Flyer # \_\_\_\_\_ Issue Date: \_\_\_\_\_

Flyer # \_\_\_\_\_ Issue Date: \_\_\_\_\_

THE BIDDER MUST TYPE/WRITE ITS TOTAL BID PRICE FOR EACH SEPARATE BASE BID ON THIS "BASE BID" SHEET. DO NOT SOLELY WRITE ANY ADDITIONAL OR DEDUCTED AMOUNT ON THE BASE BID LINE.

**Base Bid:**

For all **PLUMBING** the sum of

\_\_\_\_\_ Dollars (\$ \_\_\_\_\_).  
(Written) (Figure)



# **BID PROPOSAL**

Department of Military and  
Veterans Affairs  
Bldg. 0-47, Fort Indiantown Gap  
Annville, PA. 17003

Do not write in space below

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

Legal Review

**CONTRACT NO. 42160105  
ELECTRICAL  
HVAC & Exhaust Replacement  
Lock Haven FMS  
Lock Haven, PA. 17745**

### **Bidder Name and Address:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Bidder Phone #

Bidder Fax #

Bidder Email:

Bidder Federal ID#

Bidder Vendor ID#

**FLYER INFORMATION:** Bidder acknowledges receipt of the following  
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Flyer # \_\_\_\_\_ Issue Date: \_\_\_\_\_

THE BIDDER MUST TYPE/WRITE ITS TOTAL BID PRICE FOR EACH SEPARATE BASE BID ON THIS "BASE BID" SHEET. DO NOT SOLELY WRITE ANY ADDITIONAL OR DEDUCTED AMOUNT ON THE BASE BID LINE.

**Base Bid:**

For all **ELECTRICAL** **the** sum of

\_\_\_\_\_ Dollars (\$ \_\_\_\_\_).  
(Written) (Figure)

# BIDDER ORGANIZATIONAL INFORMATION

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## **BIDDER ORGANIZATION (Check applicable box)**

- The Bidder is a corporation, limited liability company, or partnership organized and existing under the laws of Pennsylvania and has been granted a certificate of authority to do business in Pennsylvania as required by the Business Corporation Law of 1988, as amended \_\_\_\_\_

OR

- The Bidder is a corporation organized and existing under the laws of \_\_\_\_\_ and **has or has not** (circle one) been granted a certificate of authority to do business in Pennsylvania as required by the Business Corporation Law of 1988 (15 Pa. C.S. §4121-§4131), as amended.

OR

- The Bidder is a limited liability company organized and existing under the laws of \_\_\_\_\_ and **has or has not** (circle one) registered to do business in Pennsylvania as required by the Limited Liability Company Law of 1994 (15 Pa. C.S. §8981-§8982), as amended.

OR

- The Bidder is a limited partnership organized and existing under the laws of \_\_\_\_\_ and **has or has not** (circle one) registered to do business in Pennsylvania as required by the Partnership Code (15 Pa. C.S. §8581-§8590), as amended.

OR

- The Bidder is an individual or partnership trading under a fictitious or assumed name and **has or has not** (circle one) registered under the Fictitious Names Act (54 Pa. C.S. §301-§332), as amended.

## **BIDDER RESIDENCE INFORMATION**

Bidder has a bona fide establishment in Pennsylvania at which it was transacting business when the Notice to Bidders for this Project was issued?

If **"Yes"**, insert address below if different than address on page 1:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

If **"No"**, insert Bidder's office address if different than address on page 1.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**CERTIFICATION AND BID SIGNATURE**

To Department of Military and Veterans Affairs (DMVA), Annville, Pennsylvania,

In conformity with the plans and specifications prepared by the **PROFESSIONAL as** listed on the eMarketplace website under **solicitation number 42160105** and after an examination of the site of the work, and all the contract documents including issued Flyers, which are made a part hereof as if fully set forth herein, the undersigned (hereinafter "Bidder") submits this bid and certifies by signing below:

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

**BIDDER AS AN INDIVIDUAL:**

Witness:

\_\_\_\_\_

By:

\_\_\_\_\_

Contractor – Individual

**BIDDER IS A PARTNERSHIP:**

Witness:

\_\_\_\_\_

By:

\_\_\_\_\_

Contractor – General Partner

**BIDDER IS A LIMITED LIABILITY COMPANY:**

Witness:

\_\_\_\_\_

By:

\_\_\_\_\_ Secretary  
President

**BIDDER IS A CORPORATION:**

Attest:

\_\_\_\_\_

By:

\_\_\_\_\_

President

Secretary



INSTRUCTIONS TO  
BIDDERS



**ANNVILLE, PENNSYLVANIA**

FAILURE TO COMPLY WITH THESE INSTRUCTIONS MAY RESULT IN THE REJECTION OF THE BID AS NOT RESPONSIVE.

SECTION 1. WORK TO BE PERFORMED. The Work to be performed is described in the Contract Documents. The Contract Documents may be inspected during regular business hours at the Department of Military and Veterans Affairs (DMVA), located at Fort Indiantown Gap, Building 0-47, Annville, Pennsylvania 17003-5002. Copies of the Contract Documents may be obtained through emarketplace website under solicitation 42160105.

SECTION 2. FAMILIARITY WITH PROPOSED WORK. The Bidder is responsible for examining the nature and location of the Work, the conformation of the ground, the soil and rock conditions, and the character, quality and quantity of the materials that will be required. The geotechnical report prepared for the Department, if one has been performed for the project, is available for review by all bidders. The Bidder shall also examine the proposed Contract Documents, including the plans, specifications, the Instructions to Bidders, Special Conditions (if applicable), and all other documents and data pertaining to the Project. After the award of the contract, the Contractor may not submit any claim alleging insufficient data, incorrectly assumed conditions, or misunderstanding with regard to matters for which no such clarification was sought during the bidding phase of the Project, as described further in the Instructions to Bidders of the Construction Contract.

SECTION 3. INTERPRETATION OF CONTRACT DOCUMENTS.

**A.** Requests for Interpretation during the bid stage shall be submitted in writing to the Contracting Officer, whose name and address can be found in the Notice to Bidders. All Requests for Interpretation related to the proposed Work or proposed contract documents must be received, in writing, no later than close of business ten (10) days prior to the Bid Opening Date. Only written Requests for Interpretation received no later than ten (10) days prior to the date fixed for the opening of bids will be considered by the Department. If a request is received within 10 days of the bid opening date, the Department may, in its sole discretion, answer the request. Requests via emails shall not be considered "written" requests.

**B.** NEITHER THE DEPARTMENT, THE PROFESSIONAL NOR ANY REPRESENTATIVE OF THE USING AGENCY SHOULD BE ASKED TO PROVIDE ANY ORAL INTERPRETATION TO ANY BIDDER REGARDING INTERPRETATION OF THE CONTRACT DOCUMENTS. ANY CONVERSATION BETWEEN A BIDDER AND EITHER THE DEPARTMENT, THE PROFESSIONAL, OR THE REPRESENTATIVE OF THE USING AGENCY FOR WHOM THE PROJECT IS BEING CONSTRUCTED, SHOULD NOT BE RELIED UPON BY ANY BIDDER, IS NOT BINDING UPON THE DEPARTMENT, AND SHALL NOT BECOME PART OF THE CONTRACT DOCUMENTS UNLESS THE INFORMATION SUBSEQUENTLY APPEARS IN A WRITTEN FLYER.

**C.** The Department's response to any Request for Interpretation will be in the form of a written flyer signed by the Department. The Contracting Officer will forward all flyers to all Bidders that obtained plans and specifications for the Project. All flyers become a part of the Contract Documents, and all Bidders on any portion of the contract for the Project are bound by all flyers issued on the project.

SECTION 4. AWARD TO A FOREIGN BUSINESS. No contract will be awarded to a Bidder which is a foreign corporation, a foreign limited liability company, a foreign limited

partnership, or which is operating under a fictitious or assumed name unless the Bidder has complied with, or agreed to comply with, the registration requirements under the Business Corporation Law of 1988 (15 Pa. C.S. §4121-§4131) and/or the Limited Liability Company Law of 1994 (15 Pa. C.S. §8981-§8982), and/or the Partnership Code (15 Pa. C.S. §8581-§8590), and/or the Fictitious Names Act (54 Pa. C.S. §301-§332).

SECTION 5. REIMBURSEMENT OF COSTS OF INSPECTOR GENERAL INVESTIGATION.

The Contractor shall reimburse the Commonwealth for the reasonable costs of investigation incurred by the Office of Inspector General for investigations of the Contractor's compliance with the terms of this or any other agreement between the Contractor and the Commonwealth which result in the suspension or debarment of the Contractor. Such costs shall include, but not be limited to, salaries of investigators, including overtime; travel and lodging expenses; and expert witness and documentary fees. The Contractor shall not be responsible for investigative costs for investigations which do not result in the Contractor's suspension or debarment.

SECTION 6. SMALL DIVERSE BUSINESS PARTICIPATION

A. Overview - Minimum Participation Level.

1. The Department has established one minimum participation level (MPL) for utilization of Minority Business Enterprises (MBE), Women Business Enterprises (WBE), Veteran Business Enterprises (VBEs), and Service-Disabled Veteran Business Enterprises (SDVBEs) (together referred to hereinafter as Small Diverse Businesses) subcontractors, manufacturers, and suppliers for this project. This Small Diverse Business Participation (MPLs) applies when the amount bid exceeds \$50,000.

- i. The MPL is set forth in the Notice to Bidders. in the following form:
- ii.

Project No. DGS:	42160105	-
		MPL
.1	General Construction	7.5%
.2	HVAC	7.5%
.3	Plumbing	7.5%
.4	Electrical	7.5%

- 2. If the Bidder is a Small Diverse Business firm, DGS will not credit the value of the Bidder's contract toward meeting the MPLs. All Bidders (including Bidders which are SDB) are required to comply with these Instructions to Bidders regarding Small Diverse Business Participation.
- 3. Bidders are not required to submit a form regarding the MPL or solicitation efforts with the Bid Package.
- 4. The Administrative Procedures, which are included in the Contract Documents, have a chapter titled "Small Diverse Business Participation." Should there be any conflict between these Instructions to Bidders and the Administrative Procedures, the Administrative Procedures govern.
- 5. Upon Notice of Award, the successful bidder shall have the option of choosing to "Opt- in" or creating and maintaining documentation on its "Good Faith Effort" to meet the Project's MPL. (See: subsection B(1) below). The Contractor will have the full duration of their contract to meet the MPL.

6. The Contractor's commitments toward the MPL will be calculated and credited as follows:
- i. ONLY DGS-CERTIFIED SMALL DIVERSE BUSINESSES SHALL BE USED TO CALCULATE THE CONTRACTOR'S COMMITMENTS TO THE MPL.
  - ii. A Contractor's Small Diverse Business participation level is calculated by adding all dollar commitments to DGS-certified Small Diverse Business subcontractors of all tiers, DGS-certified Small Diverse Business manufacturers, and DGS-certified Small Diverse Business suppliers and dividing that total amount by the total contract award price. Small Diverse Business dollar commitments will not be double counted (see Section 5(vii) below).
  - iii. Small Diverse Business subcontractors performing at least sixty percent (60%) of the subcontract with their own employees will be credited toward the MPL at 100 percent of the total dollar value of the subcontract/supply contract. Any Small Diverse Business subcontract, where the subcontractor performs less than 60% of the subcontract, will not be credited toward the MPL.
  - iv. Small Diverse Business stocking suppliers are credited at 60 percent of the total cost of the materials or supplies purchased. A stocking supplier is a regular dealer that owns, operates, or maintains a store, warehouse, or other establishment, in which the materials, supplies, articles or equipment of the general character described by the specifications and required under the contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business.
  - v. Small Diverse Business nonstocking suppliers are credited at only the amount of the fee or commission charged by the Small Diverse Business nonstocking supplier for assistance in the procurement of the materials and supplies provided the fees or commissions are reasonable and not excessive as compared with fees customarily allowed for similar services and with the understanding that under no circumstances shall the credit, for a Small Diverse Business nonstocking supplier, exceed 10% of the purchase order cost. A nonstocking supplier does not carry inventory but orders materials from a manufacturer, manufacturer's representative or a stocking supplier. In order for a nonstocking supplier to receive credit, it must perform a useful business function by engaging in meaningful work (i.e., negotiating price; AND determining quality and quantity; AND ordering materials; AND paying for the materials) and the fee or commission must be provided with the purchase order and the Small Diverse Business Utilization Report. Industry practices and other relevant factors will be considered.
  - vi. Small Diverse Business manufacturers are credited at 100 percent of the total cost of the materials or supplies purchased.
  - vii. All Small Diverse Business participation shall include all tiers of design and/or construction.
    1. The Contractor is allowed to use contract amounts at any tier of supply or subcontracting provided that the Small Diverse Business is the initial Small Diverse Business firm in the organizational hierarchy. Therefore, if the Contractor or any of its non-Small Diverse Business Subcontractors or Suppliers makes a commitment to a Small Diverse Business, the credit for the subcontract/purchase order commitment, regardless of the level or tier, shall be calculated as indicated in Section 5 and credited toward the Contractor's Minimum Participation

Level.

2. The dollar value of any commitment to a Small Diverse Business cannot be double counted. In the event that the Small Diverse Business whose entire subcontract value is counted towards the Contractor's Participation Level then subcontracts a portion of the work or supplies associated with this subcontract to another Small Diverse Business, the dollar value of the subcontract with/to this lower tier Small Diverse Business is NOT counted in the Contractor's Participation Level in order to prevent the duplicate counting of Small Diverse Business commitment dollars. In this case, the dollar value of this subsequent Small Diverse Business subcontract has already been included within the scope of work and dollar value of the Small Diverse Business commitment already counted as a part of the Contractor's Participation Level.

**B. Upon Notice of Award.**

1. The successful bidder shall, upon Notice of Award and receipt of the Construction Contract, determine whether to choose "opt-in" or to provide "Good Faith Effort" documentation of its efforts to meet the MPL by initialing the appropriate selection in Article 9 of the Construction Contract. (See Administrative Procedures for further information.)
  - i. Opt-in – A successful bidder selecting "Opt-in" agrees to meet or exceed the Project's MPL by the time of the Close-out Inspection of the project.
  - ii. Good Faith Effort – A successful bidder selecting "Good Faith Effort" agrees to document its use of reasonable efforts to identify, solicit, and secure commitments with Small Diverse Businesses on all subcontractors, manufacturers, and suppliers greater than \$10,000 throughout the duration of the Project.
2. Article 9 of the Construction Contract lists both "Opt-in" and the "Good Faith Effort" options. The successful bidder shall select and initial the option of their choice. Failure to select an option will be deemed an incomplete Contract and DGS may consider this a failure to execute the Contract (See Sections 28 and 29).

**C. Upon Contract Execution.**

1. If Opt-in was selected, the Contractor has until the time of Close-Out Inspection to meet or exceed the MPL for the Project. This will be tracked through the Small Diverse Business Utilization Report submitted with each Application for Payment.
2. If the Good Faith Effort was selected, the Contractor must create and maintain documentation of its reasonable efforts to identify, solicit, and secure commitments with Small Diverse Businesses on all subcontractors and suppliers greater than \$10,000 throughout the duration of the Project. At a minimum, such documentation shall include the following ("Good Faith Effort documentation"):
  - i. A certification that the contractor accessed the DGS web site database of DGS- certified Small Diverse Businesses to identify DGS-certified Small Diverse Businesses for the subcontract or purchase order.
  - ii. A record of all companies solicited for the subcontract or purchase order that can perform the scope of work to be subcontracted or supply to be delivered, identifying any DGS-certified Small Diverse Businesses. If a subcontractor is not properly licensed or otherwise capable of performing the scope of work, they are

not eligible to receive the subcontract. (A painting subcontractor, for example, may not be eligible to receive a subcontract to perform electrical work.)

- iii. A record of all quotes received showing company name and address, contact person, telephone number, Small Diverse Business status, subcontractor, manufacturer, or supplier, scope of work to be performed or supply to be delivered, and the amount of the quote and identification of the selected subcontractor/manufacturer/supplier.
- iv. A certification that the contractor negotiated fairly with responsive DGS-certified Small Diverse Businesses and, if commitments were not made, that such non-commitment related to the Small Diverse Business' capability or price.

Upon notice from DGS, the Contractor will be required to submit, within ten (10) calendar days from the date such notice is received, the above Good Faith Effort documentation for review and compliance. Failure to submit such documents within the timeframe provided will result in a noncompliance entry into the Commonwealth's Contractor Responsibility Program and may be considered a substantial breach of the Contract, as determined by the Department.

### 3. Small Diverse Business Utilization Report

- i. The Contractor, regardless of the option it selects, shall submit a Small Diverse Business Utilization Report with each Application for Payment. Each Small Diverse Business Utilization Report must have current data (totals to date) identifying at least each element as follows:

- 1. Detailed information including but not limited to any subcontracts and purchase orders documenting the dollar value commitments, commission, or fees to Small Diverse Business firms to be used toward the satisfaction of the Project's MPL. All Small Diverse Businesses identified on the Utilization Report shall be retained on the Utilization Report throughout the duration of the Project.

- 2. Detailed information regarding any work that is claimed to be self-performed by the Contractor and therefore allegedly not eligible for subcontracting to a Small Diverse Business.

- 3. Construction Subcontracts and Purchase Orders:

- a. All Subcontract/Purchase Orders awarded to date are \$\_\_\_\_\_

- b. Commitments to Small Diverse Businesses totals to date:

- i. \$\_\_\_\_\_ (dollars)

- ii. %\_\_\_\_\_ (percentage)

- c. For each Small Diverse Business subcontract and purchase order awarded since the previous Application for Payment the:

- i. Identity and status of the Small Diverse Business as a MBE/WBE/VBE/SDVBE that will be performing the work; and

- ii. The type of work, service, or material to be

performed/supplied;and

- iii. The amount paid to date on each Small Diverse Business subcontract/purchase order this month; and
  - iv. The designation of Small Diverse Business stocking suppliers as either a MEP (i.e., mechanical, electrical, and plumbing) stocking suppliers or a General Construction stocking supplier; and
  - v. The fee or commission paid to the nonstocking supplier. No MPL credit will be given if the fee or commission is not listed and, the maximum credit shall not exceed 10 percent of the purchase order cost.
- ii. Failure to submit a Small Diverse Business Utilization Report with each Application for Payment will result in an incomplete Application for Payment and it being returned to the Contractor. An incomplete Application for Payment will not be processed.

**D. Resources.**

1. The Department is available for technical assistance to all Bidders submitting bids for this contract. Department certification of an entity as a Small Diverse Business means only that the applicant for certification has submitted information that qualifies it as a Small Diverse Business in terms of its ownership and control. It does not imply, and no Bidder shall infer, that the Department has in any way investigated or approved the entity's competence to perform work.
2. Contact the Bureau of Small Business Opportunities at (717) 783-3119. Bureau of Small Business Opportunities  
611 North Office Building  
Harrisburg, Pennsylvania 17125

SECTION 7. CONTRACT DETAIL. Where the Work is shown in complete detail on only a portion of a drawing or there is an indication of continuation, the remainder being depicted or described in an outline or schematic form, the Work drawn out in detail applies to other like portions of the structure.

SECTION 8. CONTRACT ERRORS OR CONFLICTS. If the Contractor, in the course of construction, finds any conflict, error or discrepancy on or among the Contract Documents, such conflict, error or discrepancy shall be immediately referred in writing to the Department and the Professional. The Professional, with appropriate input from the Department, will review the matter and issue an interpretation to the Contractor in writing within seven (7) calendar days after the Professional receives the Contractor's Request for Information.

SECTION 9. ADMINISTRATION OF CONTRACT. The Professional will assist the Department and/or the Department's designee, in administering the Construction Contracts. The Professional will review and execute (if acceptable) all Department forms that require the Professional's review and signature under the Contract. The Professional will also review submittals as provided in these Instructions. The Professional shall assist the Department, if requested, in the review of Extension of Time requests and claims of any type.

SECTION 10. PROFESSIONAL ACCESS TO WORK. The Professional, its Consultants and authorized representatives shall have access to the Work at all times. The Contractor shall provide the facilities for such access so the Professional may

perform its functions under the Contract Documents.

SECTION 11. PROFESSIONAL INTERPRETATION OF DOCUMENTS. The Professional is the initial interpreter of the requirements of the Contract Documents. The Professional will, within seven (7) days after receipt of a request, (in the form of a Request for Information) render an interpretation. All interpretations by the Professional will be consistent with the Contract Documents. In its capacity as interpreter, the Professional will exercise its best efforts to interpret the documents impartially. Any dispute regarding such interpretation shall be handled in accordance with the Disputes Article.

SECTION 12. REJECTION OR STOPPAGE OF WORK. Whenever the Professional observes deficiencies or observes the Contractor failing to execute the Work in accordance with the Contract Documents, the Professional will promptly notify the Contractor of all such deficiencies and will issue such notices of Non-Compliant Work that the Professional deems appropriate. The Professional will recommend rejection of work that does not conform to the Contract Documents and immediately notify the Department of the recommendation of rejection. The Professional will recommend stoppage of Contractors' work or special testing whenever such testing or stoppage is necessary, in the Professional's opinion, to achieve compliance of the finished Work with the Contract Documents.

SECTION 13. RECORD DOCUMENTS. On the day of Final Inspection, the Contractor shall deliver to the Professional a complete set of contract prints in PDF format, corrected with suitable markings to show all changes or variations from the original contract, including all items uncovered during the work and showing the details of the work as actually built, including but not limited to horizontal and vertical dimensional references of all concealed pipe, conduit and other lines and equipment.

SECTION 14. PROFESSIONAL NOT RESPONSIBLE FOR CONTRACTOR MEANS/METHODS/TECHNIQUES. The Professional is not responsible for the construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work since these are solely the Contractor's responsibilities.

SECTION 15. PROFESSIONAL NOT RESPONSIBLE FOR CONTRACTOR ACTS OR OMISSIONS. The Professional will not be responsible for the acts or omissions of any Contractor, or any Subcontractor, or any of their agents or employees, or any other persons performing any of the Work.

SECTION 16. CONTRACTOR NOT AN INTENDED THIRD PARTY BENEFICIARY OF THE PROFESSIONAL AGREEMENT. The Contractor is not an intended third party beneficiary of the Professional Agreement between the Department and the Professional. Nothing in the Contract Documents between the Department and the Contractor should be construed to authorize any person not a party to the Professional Agreement to maintain any lawsuit involving that contract, unless otherwise provided by law.

SECTION 17. REPLACEMENT OF PROFESSIONAL. In case of the termination of the Agreement for Professional Services, the Department may appoint a new Professional whose status under the Contract Documents shall be that of the former Professional. The decision of whether or not to terminate a Professional and appoint a new Professional rests solely with the Department. Professional's authority to make recommendations under this paragraph, nor any decision made by the Professional in good faith to either exercise or not to exercise such authority shall give rise to any duty or responsibility of the Professional to the Contractor, or any Subcontractor, any of their agents or employees, or any other person performing any of the Work.



SECTION 18. PROCUREMENT STAGE INVESTIGATION AND DOCUMENT

REVIEW: During the procurement stage, the Contractor had an affirmative duty to examine the nature and location of the Work, the soil and rock conditions and the character, quality and quantity of the materials that are required for the Work. Any geotechnical information available for review on the Project is provided for informational purposes only; it is not to be relied upon by the Contractor. The Contractor also has a duty to carefully study and compare the Contract Documents for consistency and to the physical conditions of the job site. If the Contractor did not request a clarification during the bid stage with regard to the site conditions or discrepancies within the Contract Documents, the Contractor may not submit a claim after award of contract alleging insufficient data, ambiguity in the documents, incorrectly assumed conditions or misunderstanding.

SECTION 19. DUTY TO COORDINATE THE WORK WITH OTHER PRIME CONTRACTORS.

- A. The Contractor explicitly acknowledges that it has a contractual duty to coordinate the Work within their Contract with the Work to be performed on the Project by all other Prime Contractors.
- B. The Contractor agrees that this duty to coordinate exists between each Prime Contractor on the Project and that each Prime Contractor is an intended third party beneficiary of each Contract between the Department and each Prime Contractor.
- C. The Contractor agrees that their duty to coordinate the Work includes reviewing the other Prime Contractors' submittals for coordination purposes.
- D. The Contractor further agrees that the efforts of the Construction Manager (if one is used) and the Department to facilitate the coordination of the Work shall not release or in any way diminish the Contractors' duty to coordinate the Work.
- E. If the Contractor sustains any damage as a result of any act or omission of any other Prime Contractor having a Contract with the Department or through an act or omission of a Subcontractor of such Prime Contractor, the Contractor shall have no claim against the Department, the Professional or the Construction Manager for such damage, but shall have a right to recover such damage from the other Prime Contractor.
- F. If any other Prime Contractor on the Project sustains any damage through any act or omission of the Contractor or a Subcontractor of the Contractor, the Contractor agrees to reimburse such other Prime Contractor for all such damages and to indemnify and hold the Department, the Construction Manager and the Professional harmless from all such claims.
- G. The Contractor shall indemnify and hold the Department, the Construction Manager and the Professional harmless from any and all claims or judgments for damages and from costs and expenses to which the Department may be subjected or which it may suffer or incur by reason of the Contractor's failure to comply with directions promptly.
- H. The exercise of the right of the Construction Manager or the Department to permit or require others to perform Work in or about the construction site shall not relieve the Contractor from any liability for loss or damage, or from any of its obligations under this Contract. No agreement or arrangement between the Contractor and others as to a division or proportionate share of liability for loss or damage incurred, or of the cost of insurance shall in any way relieve the Contractor from any liability or damage, or from any of its obligations under this Contract.
- I. Each Prime Contractor shall afford other Prime Contractors reasonable opportunity

for the introduction and storage of their materials and equipment and the execution of their work, and shall properly connect and coordinate its Work with the Work awarded by the Department to other Contractors.

SECTION 20. PROJECT COORDINATION. Project Coordination shall be facilitated among the Prime Contractors, professional conduct and adherence to the Contract Specifications and the Instructions, including, but not limited to, the following subparagraphs, which shall not be construed to be the exclusive means of achieving a properly coordinated Project:

- J. Each Contractor acknowledges the complex nature of the Project, the sequential nature of the Work to be performed under all of the Prime Contracts and the concurrent operations of this Project.
- K. Each Contractor shall become thoroughly familiar with the requirements of the Contract Documents, including the Instructions of the Contract, the Administrative Procedures of the Contract, the Project Schedule and the Scope of Work for the Project.
- L. Close coordination shall be required of each Contractor with the Construction Manager, other Prime Contractors, the Department and others having an interest in the Project to assure that Work on-site, access to and from the site and the general conduct of operations is maintained in a safe and efficient manner, and that disruption and inconvenience to existing streets and the surrounding community is minimized.
- M. Each Contractor is responsible for coordinating their Work with every Prime Contractor on this Project.
- N. The Contractor shall, whenever conditions permit, proceed without delay and maintain the Project Schedule. All operations shall be conducted so as to comply with all applicable laws, ordinances and regulations.
- O. The Contractor shall maintain free access to all buildings, gates and areas of the site for emergency vehicles, service vehicles and firefighting equipment and at no time shall block off or close roadways or fire lanes without providing auxiliary roadways and means of entrance acceptable to the Department.
- P. There may be limited parking at the site. Each Contractor and their sub-contractors must limit temporary parking of company vehicles and storage of materials as can be accommodated within the limits of the construction site and staging area as directed by the Department unless noted otherwise within the Contract Documents. All transportation to the site is the responsibility of each Prime Contractor. Contractors shall not park in spaces reserved for State employees. If more than one ticket is issued to an individual for parking violations, the Department has the authority to prohibit the owner of the vehicle(s) from continuing work at the site.
- Q. Prime Contractors shall work similar hours in order to prosecute the Work under an orderly and systematic means. If there is a disagreement between Prime Contractors relative to the normal work hours, the Department shall establish the hours to be worked by all Prime Contractors. No claim of hardship shall be made by any Prime Contractor as a result of the Department's decision.
  - 1. Whenever the Contractor intends to depart from normal work hours, it shall notify the Department at least forty-eight (48) hours in advance, unless there is an emergency-type condition requiring immediate repair or attention. If such an emergency condition occurs, the Contractor shall provide immediate notification to the Department. Failure of the Contractor to give such timely notice may be cause for the Department to require the removal or uncovering of Work

performed without the knowledge of the Department, at no additional costs or Extension of Time, regardless of whether or not the Work is deemed properly installed.

- R. The Contractor shall coordinate the Work with all other Contractors as outlined in the Coordination Drawings so that interference between mechanical, electrical, architectural and structural Work, including existing services, will be avoided. The Prime Contractors shall also coordinate the Work so as to provide the maximum practical space for operation, repair, removal, and testing of equipment. The Prime Contractors shall keep pipes, ducts, conduit and the like as close as possible to ceiling slab, walls, and columns to take up a minimum amount of space. The Prime Contractors shall locate pipes, ducts, conduits and equipment so that they do not interfere with the intended use of eyebolts and other lifting devices.
- S. Particular attention shall be given to coordination and correlation of submittals as to the requirements of the Contract Documents regarding:
  - 1. Motor size;
  - 2. Motor service connections for size and type of materials;
  - 3. Equipment size and supports;
  - 4. Piping routing;
  - 5. Penetration of materials and fire stopping; and
  - 6. Connections to another Contractor's Work.
- T. Contractors shall coordinate Work to determine exact locations of outlets, pipes, diffusers and pieces of equipment to avoid interference with properly installed Work.
- U. The Contractor shall be responsible for a complete operating system as designated within the Contract Documents. Major items for Mechanical Work are specified in Division 15 and Electrical Work in Division 16. This may not be the complete extent of this Work, however, since requirements may appear in other locations within the Contract Documents. Mechanical and Electrical Work shall be verified with other sections. Contractors performing that Work shall supply sufficient information for completing the system.
- V. As various areas or parts of the site and building are complete, or otherwise suitable for the subsequent Contractors to commence Work, those Contractors shall be allowed to deliver materials and start Work. Such phased commencement shall be in accordance with the Project Schedule. Prior to commencing Work at any area or part, certain contract requirements shall be met for that area or part, such as verification of conditions as specified. Material lay down areas shall be coordinated with the Department and other Contractors.

SECTION 21. COORDINATION. The Lead Contractor is principally responsible for the coordination of the Project Work. Each Contractor is to coordinate all of its Work with the Work of other Contractors for proper function and sequence to avoid construction delays. If necessary, in instances when the Lead Contractor and the other affected Prime Contractor(s), after due diligence, cannot agree on a coordination decision, the Department will upon request from one or more of the Prime Contractors, make a determination resolving the coordination issue and take whatever action(s) the Department deems necessary, including, but not limited to:

- 1. Withholding any payment otherwise due until the Contractor(s) comply with the Construction Manager's or the Department's direction; and/or
- 2. Directing others to perform portions of the Work and deducting the cost of the Work from the Contractor's Contract balance; and/or

3. Deleting through credit Change Orders any and all portions of the Work.

The Department's decision in no way releases the Prime Contractors from their continuing duty to coordinate the Work. The final coordination decision of the Department will be observed, accepted, and fully followed by all Contractors and their subcontractors on the Project, subject only to the disputes procedure set out in the Contract. The progress of the Work in accordance with the final coordination decisions of the Department shall not be delayed pending any such dispute proceeding.

SECTION 22. USE OF SITE. The Contractor shall confine its apparatus, the storage of its equipment, tools and materials, and its operations and workers to the limits of contract as permitted by law, ordinances, permits, the Contract Documents and the Department. The Contractor shall not unreasonably encumber the site with any materials or equipment. The Lead Contractor shall have the authority to identify the lay down area based upon the Project Schedule.

SECTION 23. MOBILIZATION. Mobilization limits shall be consistent with the description set forth in the Administrative Procedures. The following items are included as mobilization, and cannot be included separately on the breakdown:

- Contractor's field office
- Department's field office (unless otherwise specified in specifications)
- Heating, lighting and telephone for the field offices
- Installation for the offices Installation
- of signs
- Site survey
- Construction fence, if required
- Sidewalk bridge, where required and built to all applicable OSHA requirements
- Safety and first aid equipment
- Temporary power setup Temporary
- power distribution Temporary
- water
- Temporary sanitary

SECTION 24. CONTRACTOR'S STAFF AND PHONE NUMBERS. Within ten (10) days of receipt of the Contract, the Contractor shall submit to the Department's Project Manager the New User Form with a maximum of three (3) proposed principal staff that will be assigned to the Project. This shall include the name, address, email address, and telephone numbers of the Contractor's Superintendent and other personnel assigned to the Project.

SECTION 25. DRAWINGS AND SPECIFICATIONS AT THE SITE.

1. The Contractor shall maintain in good order at the site, for the Department and the Professional, one (1) paper copy of all drawings and specifications. All addenda, contract modifications, change orders and requests for information shall be posted to these documents at the applicable locations. As appropriate, these documents will be updated daily to record accurately as-built conditions, selections and changes.
2. The Contractor shall also maintain at the site one (1) paper copy of approved shop drawings, catalog data, operating and maintenance instructions, certificates, warranties, samples and similar submittals.

These shall be available to the Department and Professional at all times, and they shall be delivered to the Professional as part of the Operation and Maintenance Instruction Manuals.

3. The Contractor shall also maintain one (1) paper copy of approved coordination drawings, to include as-built conditions, selections and changes to be submitted to the Professional and included as part of the Operation and Maintenance Instruction Manuals. The Contractor shall include the value of the Record Drawings as a line item on its schedule of values, which shall be not less than 10% of the amount included for mobilization. The amount included is subject to the approval of the Department.

SECTION 26. PROVISION OF LABOR AND MATERIALS. Unless otherwise specifically noted, the Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and all other facilities and services necessary for the proper execution and completion of the Work.

SECTION 27. RESPONSIBILITY FOR THOSE PERFORMING WORK. The Contractor is responsible to the Professional, the Department and all other Prime Contractors for the acts and/or omissions of all of its employees and all subcontractors, their agents and employees, and all other persons performing any of the Work under a contract or purchase order with the Contractor.

- a. EQUIPMENT AND MATERIALS. The Contractor shall furnish and deliver the necessary equipment and materials in ample quantities and as frequently as required to avoid delay in the progress of the Work. The Contractor's materials or equipment shall not interfere with the orderly progress of the Work, nor endanger the lives of any operators or persons within the vicinity of the stored equipment or materials, nor to cause damage to the adjacent property or highways. Any damage resulting from the operations of such equipment to any person or property is the responsibility of the Contractor in accordance with the Insurance paragraph.
  - b. SUPERVISION. If a Contractor has more than one Contract on the Project, it must provide a separate Superintendent for each Prime Contract. The Contractor shall provide on-site supervision by an employee who shall act as the duly authorized and competent Superintendent. If the Contractor fails to comply with the provisions of this paragraph, the Department may: (1) withhold any payments which are or may become due to the Contractor; and/or (2) suspend the work at the expense of the Contractor, including the cost associated with the impact on the work of the other Prime Contractors; and/or (3) take a credit for each day the Contractor did not have the approved Superintendent on site.
1. ON SITE: This Superintendent shall be on-site during the progress of the Work, including any time when any Work is being performed by any Prime Contractor or any subcontractor that will impact the Work of the Contractor. The Superintendent shall represent the Contractor, and all communications given to the Superintendent shall be binding as if given to the Contractor. The Superintendent must attend all Monthly Schedule Update Meetings and every bi-weekly job conference. The Monthly Schedule Update Meetings shall be scheduled and chaired by the Superintendent for the Lead Contractor.

2. QUALIFICATIONS: At the Initial Job Conference, the Contractor shall submit to the Department the name and qualifications of its Superintendent. The Superintendent must meet the qualifications in the specifications and be acceptable to the Department. The Contractor shall not change its Superintendent at any time during the Project without the prior written approval of the Department, and must submit to the Department, in writing, justification for the change, along with the name and qualifications of the individual whom the Contractor proposes to be the new Superintendent. The Department reserves the right to require a change in the Superintendent if the Superintendent's performance is deemed by the Department to be inadequate.

SECTION 28. GOOD ORDER AMONG EMPLOYEES. The Contractor shall enforce good order and conduct among its employees at all times. Every employee shall be skilled in the performance of work assigned to that employee. All construction personnel shall be respectful of all Commonwealth employees and the general public.

I. Any incidents of disrespect, verbal abuse, threatening statements, acts indicating a violation of the Contractor's Drug and Alcohol policy, unwelcome comments, unwelcome interaction or any form of harassment from any construction personnel toward any Commonwealth employee, designee employees, or the general public is strictly prohibited. Any such act shall constitute sufficient cause for the Department to demand that the Contractor dismiss the person(s) from the job site.

II. If any Contractor's personnel ignores or refuses to take action on any requirements of the Contract Documents, ignores or refuses to take immediate action to correct any endangerment to the health and safety of the public, as solely determined by the Department then this action and/or inaction shall be sufficient cause for the Department to demand that the Contractor dismiss the person(s) from the job site.

III. When, in the sole determination of the Department, it would be in the best interest of the Project and the Commonwealth to have a Contractor's personnel removed from the Project for the reasons described above, then the Department may demand that the Contractor dismiss from the job site. Any violation is sufficient cause for the Department to direct that the Contractor remove such person from employment on the Project, and direct that they shall not be re-employed on that Project without the consent of the Department. Such actions taken by the Department shall not constitute grounds for a delay claim. The Department will not be responsible for any delays caused to the Project due to any individual being removed from the Project.

SECTION 29. SURVEYS, LAYING OUT AND EXECUTION OF THE WORK

I. The Contract Drawings shall be used for all dimensions in laying out the Work under this Contract.

II. Each Prime Contractor is responsible for laying out their work from the points established by the drawings.

III. The Contractor shall utilize a competent licensed surveyor to lay out the Work from the initial points established on the drawings.

IV. The surveyor shall take as a basis the figures on the plans, and shall lay out all intersections, all building lines at corners and centers, test and check all elevations and levels, locate levels and plumb lines of floors, walls, beams and columns and other parts of the construction as the Work progresses.

V. All Work of every description shall be laid out by the Contractor, who

is solely responsible for its correctness. The Contractor shall pay for all expenses in connection with this Work.

VI. The Contractor shall furnish approved copies of all information (site plans, technical data, topographic surveys, Record Drawings, etc.) to other Prime Contractors as necessary for the purpose of coordination of the Work. The Contractor shall submit one copy of its survey notes to the Department for record keeping. Submission of the survey notes does not relieve the Contractor of its duty to identify discrepancies on the site or in the Contract Documents.

VII. All significant monuments and benchmarks identified by the Contractor shall be preserved for use by other Contractors. Receiving these monuments and benchmarks from another Contractor does not relieve each Contractor of the responsibility for its own layout, including specific layout required by applicable sections of the Contract Documents.

SECTION 30. DISCREPANCY OR INTERFERENCE WITH OR BY THE WORK OF OTHER CONTRACTORS. Since the proper execution or results of any part of the Contractor's Work will depend upon the Work of other Prime Contractor(s) (or such other Prime Contractor's Subcontractor(s)) the Contractor shall inspect and promptly report in writing to the Professional, the Department and/or the Department's designee, and the Contractor(s) whose Work is allegedly incorrect describing any discrepancies, defects or delays in the Work done by other Prime Contractor(s) that render it unsuitable for such proper execution and results. If the Contractor begins physical work, the Department assumes that the Contractor has inspected and reported any of these discrepancies.

1. In the event that any Prime Contractor commences Work, failure of the Contractor to so coordinate, inspect and report constitutes an acceptance of the other Prime Contractor's Work as fit and proper to receive its Work. This excludes defects that may develop in the other Prime Contractor's Work after the execution of the Contractor's Work. If such defects occur, the Contractor who installed the defective Work shall be responsible to correct its Work accordingly.
2. The Contractor's Work shall be conducted so as to not interfere with the Work of any other Contractors. In the event that any Prime Contractor does not complete the various portions of the Work in cooperation with the other Prime Contractors, and as a result, causes damages or injury to any other Prime Contractor, the damaged or injured Prime Contractor may submit a request for the Department to withhold funds, or settle by contract or arbitration such claim or dispute in accordance with the provisions of the Dispute Article and the Standard Terms and Conditions.
3. Each Contractor shall be liable for all damage or destruction caused directly or indirectly (including, but not limited to delay and inefficiency claims) by its operations to all parts of the Work, both temporary and permanent, and to all adjoining property.

SECTION 31. EXISTING UTILITIES AND SERVICES.

1. The Contractor shall comply with all notification requirements established by applicable law relative to protection of underground utilities and shall also check the location of existing utilities required to remain in place, including those overhead or underground, and take all necessary precautions to prevent injury or damage during the performance of the Work.
2. Each Contractor doing excavation work is responsible for costs associated with locating all existing underground utilities prior to

commencing excavation, including utilities that are owned and operated by the Department of General Services or the Client Agency.

3. Each Contractor shall be responsible for the associated cost of any utility interruption and repair due to this excavation if the utility location was not requested, and/or proper location procedures were not performed and/or followed prior to commencing excavation.
4. The Contractor responsible for damaging the utility shall immediately notify the utility company and the Department and assume the cost of restoring the service of any utility disrupted due to excavation, or any Contractor action, whatever the circumstance. The Department reserves the right to immediately restore the service of any utility disrupted due to actions of a Contractor and to deduct the cost of such restoration from the responsible Contractor's next Invoice.
5. Utilities and/or other services, which are shown, or not shown but encountered, shall be protected by the Contractor from any damage from any Work and operations of the Contract, unless or until they are abandoned. If the utilities or services are not abandoned at time of damage, the Contractor shall immediately assume the cost of repairing any damage from its Work or operations and assume the cost of restoring the utilities and services to the condition that existed prior to the damage.
6. The Contractor and Subcontractor of any tier shall be responsible for all damage to the Project including the existing building and grounds due to its operation under this Contract. Repair or replacement of damaged items shall be to the satisfaction of the Department.

**SECTION 32. INTERRUPTION OF EXISTING SERVICES:** Whenever it becomes necessary to interrupt existing services in use by the Client Agency, such as sewer, water, gas and steam lines, and electric service, the Contractor responsible for working outside of normal working hours shall perform the Work during such hours, as required by the Department in coordination with Client Agencies or other tenants, so as to complete the work and restore all existing services with minimal interruption or disruption to the Department, Client Agencies or other tenant. The Contractor responsible for the Work shall continue its work on a twenty-four (24) hour basis until the Work is completed and the service restored, or at such alternate time required by the Department, its designee, or the Client Agency or other tenants. Before beginning such Work, the Contractor shall request and receive approval from the Department to establish a time when interruption of the service will cause a minimum of interference with the activities of the Client Agency. The Contractor's request to interrupt ANY SERVICE must be submitted to the Department in at least FIFTEEN (15) CALENDAR DAYS PRIOR to the date of the desired interruption.

**SECTION 33. CONTRACTOR PERFORMING EXCAVATION OR DEMOLITION.** The Contractor performing excavation or demolition work shall fully comply with the requirements of the Pennsylvania One Call Act (Act 287-74, approved December 10, 1974, as amended) relative to protection of underground utilities, to the extent that this language conflicts with Act 287-74, the statutory language controls. Protection of underground utilities shall include, but not be limited to:

1. Ascertaining the approximate location and type of utility lines adjacent to and within the contract limits by inspecting drawings or obtaining a list of utility companies' lines adjacent to and within the contract limits from the County Recorder of Deeds and then contacting the utility company.
2. Three (3) business days before excavation or demolition, request information from the utility companies regarding the steps



Contractors should take to avoid damage.

3. Provide the Department and each equipment operator or blaster with information obtained in (A) and (B) above.
4. Report to the Department and the utility company any damage to utility line made or discovered in the course of the work.
5. Alert the Department and any occupants of premises as to emergency created or discovered.
6. Provisions of (A), (B) and (C) do not apply in an emergency. An emergency is any condition constituting a clear and present danger to life or property caused by escaping gas, exposed wires or other utility line breaks or defects.
7. Each Contractor shall be responsible for all dewatering as noted under Environmental Quality Control and per the specifications.

SECTION 34. OBSERVATION AND/OR INSPECTION OF THE WORK BY OTHERS. Observation of the Work by the Department or observation/inspection of the Work by the Professional shall not relieve the Contractor of full responsibility for completing the Work in accordance with the Contract Documents. Work performed without direct observation by the Department or Professional shall not relieve the Contractor of full responsibility for completing the Work in accordance with the Contract Documents. The Contractor's responsibilities include, but are not limited to, performance, supervision, scheduling and coordination of the Contractor's Work.

SECTION 35. COORDINATION DRAWINGS FOR SLEEVES AND OPENINGS.

1. Contractors requiring sleeves and openings for their work in any deck, concrete slab or wall shall furnish to the Department and all other Prime Contractors involved a complete set of location sketch drawings showing size and shape of openings. An electronic set of the Contract Drawings is available in eMarketplace. Each Prime Contractor must complete these sketch drawings in accordance with the construction schedule. Each Prime Contractor is responsible for reviewing every other Prime Contractor's drawings so that there will be no interference and/or conflict with its portion of the Work. Any potential conflict or interference shall be reported in writing to the Lead Contractor, with copies to the Department and the Professional. The Lead Contractor is principally responsible for coordinating and resolving any interferences and/or conflicts identified by the Prime Contractors. Disputes arising out of this paragraph shall be resolved in accordance with the Coordination Disputes paragraph.
2. The responsibility for identifying and dimensioning floor, wall, and ceiling systems penetrations lies with the Contractor whose Work penetrates these systems. The location, elevation, and dimensions of the opening, as well as installation of sleeves, fire safing, escutcheons and inserts shall be the responsibility of the Contractor requiring the opening or penetration. All Prime Contractors whose Work encompasses concrete, masonry, and ceiling installation shall provide openings required by other Contractors as agreed to in the previous paragraph.
3. The need for the opening or penetration, as well as the details, shall

be given to the appropriate Contractor no later than seven (7) days prior to the wall, floor, or ceiling system being formed or installed, based on the current progress of the Work. The Contractor will be responsible to maintain the coordination of all penetrations during the construction with each other Contractor.

4. Any Contractor who fails to provide adequate notification or details to the wall, floor or ceiling Contractor shall be responsible for providing the openings in accordance with the provisions of the Cutting and Patching paragraphs.

5. Cutting and Patching of penetrations through existing systems or through systems completed earlier in the Project are the responsibility of the Contractor requiring the penetration.

6. Cutting of metal deck in floors and roof openings is the responsibility of the Contractor requiring the opening. Deck shall not be removed until the day the penetration is to be made. The Contractor shall verify that conduits, piping or structural components installed above or below the deck are clear of the opening prior to cutting and patching.

7. At all openings that create a potential safety concern, the Prime Contractor who created the opening shall be responsible to provide adequate and safe protection.

a. CUTTING AND PATCHING OF NON-ROOF SYSTEM WORK. The Contractor shall, at its own cost, do all cutting, fitting and/or patching of existing materials required for its Work to the minimal extent necessary in accordance with the Contract Documents or to make its several parts fit together properly, and fit it to receive or be received by work of other Contractors. Any cutting, patching or excavation by the Contractor shall be supervised and performed in a workmanlike manner that will not endanger persons nor damage or endanger the Work or any fully or partially completed construction of any other Prime Contractor. The Contractor making the cut shall be responsible for restoration of work or any adjacent repairs. Any cost incurred by another Prime Contractor or the Department due to non-conforming or improperly sequenced work shall be borne by the Prime Contractor responsible therefore. Any damages to the new or existing facility shall be borne by the Contractor responsible for the damage.

b. CUTTING AND PATCHING OF ROOF SYSTEMS. Unless otherwise specified, each Contractor is responsible for its own cutting and patching of existing roof systems necessitated by its Work. The cutting and patching must be performed by a qualified Contractor/Subcontractor. The cutting and patching must maintain any current warranty or bond on the roofing, and, whether under warranty or not, must be done in accordance with the manufacturer's written directions.

#### SECTION 36. CLEANING THE PROJECT.

1. Each Prime Contractor shall keep the building and grounds maintained free from accumulations of waste materials, rubbish and debris.

2. The Contractor shall maintain a clean and safe passageway for the

Department, the Professional and others utilizing the facility.

3. Each Contractor shall insure that their Work shall not damage streets connecting to the Project, which shall be protected from mud, sand, and stones/gravel. Streets and adjacent property sites shall be kept free from run-off, litter, and/or debris in any form from the project site. Mud, litter, and/or debris from the construction site that appears on adjacent property sites shall be removed immediately. All mud collected on vehicle tires shall be removed by each Contractor before leaving the construction area. If any mud or debris from the project site collects on the streets, it shall be removed immediately by the responsible Contractor to prevent any hazards to vehicular or pedestrian traffic, as well as from entering the storm sewer system. All streets and property sites adjacent to the project site shall be cleaned of construction related debris, dust, litter, and mud daily.

4. Each Contractor is prohibited from discharging any waste products from concrete trucks or from concrete coring work, or any other unsuitable materials, fluids or other products on the site, or into the storm sewer system.

5. If the responsible Prime Contractor fails to comply with these requirements, the Department reserves the right, with twenty-four (24) hours prior notice to the responsible Prime Contractor, to assign another Contractor to clean and/or remove mud, trash, litter, debris, or any unauthorized discharge from the project and/or the adjacent streets or properties. In such case, the cost of the cleaning and/or removal, or mobilization for cleaning and/or removal shall be deducted by the Department from the responsible Prime Contractor's next Application for Payment.

6. The Contractor, and subcontractors of any tier, shall be responsible for and include in its bid, the cost for cleanup and removal from the site of its identifiable debris including, but not limited to, bulky debris, packaging containers, unused materials and equipment, and materials unsuitable for disposal by standard commercial procedures (i.e., masonry and concrete materials, crates, combustible items, etc.).

7. If the Contractor(s) fails to maintain a satisfactory cleanup program, the Department will issue a twenty-four (24) hour notice of deficiency. If the Contractor does not respond to the notice from the Department, then the Department shall arrange for the performance of the cleanup and backcharge the Contractor(s) for all costs associated with the cleanup.

8. All construction salvage materials, not including items specified elsewhere to be returned to the Department, become the property of the Contractor and shall be taken from the premises. On-site storage of materials and equipment, other than for use in this Project, will not be permitted.

9. No rubbish or debris shall be dropped from a height of more than six feet, or thrown out of any window or opening without a chute.

10. The following, which is not all-inclusive, lists the cleaning levels required by each Contractor as applicable to the scope of Work included in its Contract prior to Final Inspection:

11. Remove labels which are not required as permanent labels;

12. Clean transparent materials, including mirrors and window/door glass, to a polished condition;

13. Remove substances which are noticeable as vision-obscuring materials;
14. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of dust, stains, paint splatters, films and similar noticeable distracting substances. Except as otherwise indicated, avoid disturbance of natural weathering of exterior surfaces. Restore reflective surfaces to original reflective condition;
15. Clean concrete floors; in non-occupied spaces, broom clean; remove all stains, marks, paint, rust, etc. caused by construction activities.
16. Clean plumbing fixtures to a sanitary condition, free of stains, including those resulting from water exposure; and
17. Clean mechanical and electrical equipment, ductwork and replace all filters.
18. Prior to Final Inspection, in addition to the cleaning specified above, the site shall be prepared for occupancy by a thorough cleaning, including removal of all trash, rocks, wood and / or debris as required. Roadways and sidewalks shall be washed and swept clean. These activities shall be coordinated by the Lead Contractor.
19. Before the acceptance of the Project by the Department at the Final Inspection, all visible finished surfaces and materials shall be thoroughly cleaned and/or retouched by the responsible Contractor at its own cost and shall be left in a clean and unblemished condition to the satisfaction of the Department. Surfaces that are to be finished shall have all plaster, mortar and other surplus materials removed before beginning painting, varnishing and other finishing.

**SECTION 37. REPAIR OF DAMAGED WORK.** The Department shall coordinate the repair of all new Work as well as existing Work required remaining but which becomes damaged during the course of the Work. This repair work shall include, but not be limited to, restoration of surfaces to the original condition, grading, landscaping or seeding, pavement markings and refinishing.

**SECTION 38. CHASES AND OPENINGS.** The General Contractor (.1) or, if no General Contractor, the Contractor indicated in the Contract Documents will construct or have built into new walls, new partitions and new floors, all such chases and openings as are required for the Project. Each Prime Contractor will be responsible to confirm that the chases and openings affecting its Work are installed in accordance with the drawings submitted to the General Contractor.

**SECTION 39. CHASES AND OPENINGS AFTER CONSTRUCTION OF WALLS.** If cutting of chases and openings is required after construction of walls, partitions or floors is completed, the Department may require the Work to be performed in such a manner as to result in unmarred Work, even to the extent of requiring the removal and rebuilding of walls and partitions, all of which shall be at the sole cost of the responsible Contractor.

**SECTION 40. TESTS.** If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to be inspected, tested or approved, the Contractor shall give the Department timely notice of its readiness and of the date arranged, so the Department may observe such inspection, testing or approval. The Contractor shall be responsible for scheduling such inspections, tests and approvals and shall bear all costs of such inspections, tests and approvals, unless otherwise provided.

1. All expenses incurred in the collection, packing and delivering of samples or materials or equipment to the Project site shall be paid for by the Contractor.
2. The Contractor shall pay the costs of transporting samples from the Project site to the laboratory and for the testing of same, except where otherwise noted, specifications, or called for in the Contract drawings.
3. Approved samples to be incorporated in the building shall be returned to the Project site by the testing laboratory under the supervision of the Contractor.
4. The Contractor shall bear all costs of such inspections, tests and approvals, including such assistance, labor, electricity, fuels, storage, apparatus and instruments as are normally required for examining, measuring and testing any materials or Work and shall supply samples of materials, before incorporation in the Work, for testing as may be selected and required by the Department or the Professional.
5. Prior to testing, inspection or verification, the Department may require sign-off by the Contractor's representative affirming that the item of Work or installation is complete and ready for such testing, inspection or verification.
6. Work requiring testing, inspection or verification of probable compliance of Work shall not proceed to be concealed, covered or closed up until approval is given by the Department. Examples of work to be reviewed before being concealed include but are not limited to: sub-grades prior to backfilling, verification of rebar and formwork prior to placing concrete, and installed Work in concealed spaces before the space is closed.
7. The non-productive downtime or delay in an operation required to provide the reasonable opportunity for testing or verification by the Department constitutes a portion of the Contract Work and is included in the Contractor's contract price. No claim for additional compensation will be allowed related to establishment and timely observation of testing or verification of Work.
8. Testing or verification by the Department shall in no way relieve the Contractor of its obligation to meet all the requirements of the Contract Documents.
9. Contractor is responsible for all Quality Control testing as specified in the Contract Documents.
  - a. If, after the commencement of the Work, the Department determines that any work requires special inspection, testing or approval not included in the Tests, the Department will direct the Contractor to order such special inspection, testing or approval, and the Contractor shall give notice as in the Tests Paragraph.
  - b. If such special inspection or testing reveals a failure of the Work to comply with the requirements of the Contract Documents, or with respect to the performance of the Work, with laws, ordinances, rules, regulations or orders of any public authority having jurisdiction, the Contractor shall bear all costs thereof, including the Professional's additional services

made necessary by such failure.

c. If the work is in compliance, the Department shall bear such costs and an appropriate change order shall be issued to the Contractor.

SECTION 41. CERTIFICATES OF INSPECTION. The Contractor is responsible to secure any required certificates of inspection, testing or approval. Such required certificates of inspection, testing and approval include those required by the UCC. The Contractor shall deliver such certificates to the Professional and the Department within seven (7) days after the Contractor secures the certificate.

SECTION 42. OBSERVATION OF TESTING. The Professional and, where required by the Uniform Construction Code, Labor and Industry, shall observe the inspections, tests or approvals required by the Tests and Special Testing Paragraphs, and it shall be the Contractor's responsibility to serve sufficient notice to the Professional and where required by the UCC, to Labor and Industry, of such inspections, tests or approvals to enable the timely inspection of the Work without impacting the project schedule.

1. UCC REQUIRED TESTING OBSERVATION AND/OR INSPECTION. When the UCC requires any special testing to be observed, inspected and approved by the Department of Labor and Industry, each respective Prime Contractor shall be responsible to contact Labor and Industry sufficiently in advance to allow Labor and Industry to schedule such observation, inspection and approval of such testing. Each Prime Contractor is responsible for determining whether the UCC requires the Department of Labor and Industry's approval of the testing. The Work shall remain accessible and exposed for inspection by Labor and Industry.

SECTION 43. EFFECT OF TESTS. Neither the observations of the Professional nor inspections, tests or approvals by persons other than the Contractor relieve the Contractor from its obligations to perform the work in accordance with the Contract Documents.

SECTION 44. ENVIRONMENTAL QUALITY CONTROL. The Contractor and its Subcontractors shall perform their work in a manner which minimizes the possibility of air, water, land and noise pollution.

1. Each Contractor shall be responsible for all dewatering to prevent surface water and ground water from entering excavations (including foundations and drilled piers), from ponding on prepared subgrades and from flooding the Project site and surrounding areas.

2. Each Contractor shall be responsible to protect subgrades from softening, undermining, washout, and damage by rain or water accumulation. Each Contractor shall reroute surface water runoff away from excavated areas. No Contractor shall allow water to accumulate in excavations. No Contractor shall use excavated trenches as temporary drainage ditches.

3. Each Contractor shall be responsible for installing a dewatering system to keep subgrades dry and convey ground water away from excavations. Each Contractor

shall maintain the dewatering system until dewatering is no longer required.

SECTION 45. SOLID WASTE. Storage, collection, transportation and final disposal of solid waste shall be in accordance with the Solid Waste Management Act regulations and standards of the Department of Environmental Protection (DEP). Immediately upon the effective date of the contract, the Contractor shall begin to obtain, at its cost, the necessary permit(s) from DEP and conduct waste disposal on site approved under this permit. A copy of this permit must be submitted to the Department before commencing waste disposal. A record of receipt of the waste material that is signed by the waste company certified to receive the waste material acknowledging receipt and proper disposal must be provided to the Department.

SECTION 46. COMPLIANCE WITH STATUTES & REGULATIONS ADMINISTERED BY DEP. The Contractor shall comply with all statutes and regulations of the Commonwealth of Pennsylvania concerning environmental quality control administered by DEP. These statutes and regulations include those listed in the Environmental Statement set forth in the Instructions to Bidders (which is included as part of the Contract Documents ) and, but not limited to, the Clean Streams Law, the Clean Water Act, Pennsylvania Sewage Facilities Act, Air Pollution Control Act, Surface Mining Conservation and Reclamation Act, Bituminous Coal Open Pit Mining Conservation Act, Dams and Encroachments Act, Water Well Driller's Act, Water Works Act and Atomic Energy Act, all as amended to date. The Contractor is responsible for any violations and shall secure all required permits. Erosion control measures are shown on drawings and specifications and/or specified in the General Requirements. An erosion control permit, if required, will be obtained by the Professional.

SECTION 47. BURNING OF MATERIALS. Burning of materials from clearing and grubbing operations, periodic and final clean-up, and all related construction, shall be governed by local codes and ordinances and/or DEP regulations. For each day that the Contractor may contemplate open burning, it shall secure approval from DEP. Failure to secure permission for open burning will require the Contractor to remove material from the project site and dispose of it in a manner acceptable to DEP.

SECTION 48. SUSPENSION FROM METAL ROOF DECKS – NEW AND EXISTING. Ductwork, conduit, ceiling systems, lighting fixtures or any other miscellaneous equipment shall not be suspended from metal roof decks. These components shall only be suspended from the structural members or a suspension system supported by the structural members. All concentrated loads must be submitted for review by the Professional. If the concentrated loads are not approved, the Prime Contractor furnishing the equipment must provide an acceptable means of distributing the load.

a. ASPHALT OR TAR KETTLES. Asphalt or tar kettles shall not be used inside of or on the roof of any building. Fired kettles shall not be left unattended. There shall be at least one portable fire extinguisher with a minimum 20 B: C rating within thirty feet of each fired kettle and one additional portable fire extinguisher with the same rating by the work area.

b. INSULATION. All insulation incorporated into the project must contain the minimum percentage of post-consumer recovered paper or recovered material as shown below for the applicable product:

<u>MATERIAL TYPE</u>	<u>PERCENT BY WEIGHT</u>
Cellulose loose – fill and spray on	75% post-consumer recovered paper
Perlite Composite Board	23% post-consumer recovered paper
Plastic rigid foam, polyisocyanurate/polyurethane	
Rigid Foam	9% recovered material
Foam-in-Place	5% recovered material
Glass Rigid Foam	6% recovered material
Phenolic Rigid Foam	5% recovered material
Rock Wool	50% recovered material

c. ENFORCEMENT OF INSULATION

REQUIREMENT. The Contractor may be required to provide the Commonwealth with documentary evidence that the insulation provided for the Project was produced with the required minimum percentage of post-consumer recovered paper or recovered material.

d. LANDSCAPING PRODUCTS RECYCLED CONTENT.

1. REQUIREMENT: All landscaping products offered by the Contractor or included in the final product and sold to the Commonwealth MUST contain the minimum percentage of post-consumer and recovered material content as shown below for the applicable products:

LANDSCAPING PRODUCTS	RECOVERED MATERIAL CONTENT
Hydraulic Mulch: Paper Wood/Paper	100% (post-consumer) 100% (total)
Compost Made From Yard Trimmings and/or Food Waste	Purchase or use compost made from yard trimmings, leaves, grass clippings and/or food wastes for applications such as landscaping, seeding of grass or other plants, as nutritious mulch under trees and shrubs, and in soil erosion control and soil reclamation. The Department further recommends implementing a composting system for these materials when agencies have an adequate volume and sufficient space.
Garden Hose: Rubber and/or Plastic	60% (post-consumer)
SOAKER HOSE Rubber and/or Plastic	60% (post-consumer)
Lawn and Garden Edging: Rubber and/or Plastic	30% (post-consumer)/30-100% total
LANDSCAPING PRODUCTS	RECOVERED MATERIAL CONTENT
Landscaping Timber and Posts: HDPE	25% (post-consumer)+50% (recovered)



Mixed Plastics/Sawdust	50% (post-consumer)+50% (recovered)
HDPE/Fiberglass	75% (post-consumer)+20% (recovered)
Other Mixed Resins	50% (post-consumer)+45% (recovered)

- A. POST-CONSUMER MATERIAL: Any product generated by a business or consumer that has served its intended end use, and that has been separated or diverted from solid waste for the purposes of collection, recycling and disposition.
- B. RECOVERED MATERIAL: Refers to waste materials and by-products which have been recovered or diverted from solid waste, but does not include those materials and by- products generated from, and commonly reused within, an original manufacturing process.
- C. CONTRACTOR'S CERTIFICATION: Contractor certifies that the landscaping product(s) which the Contractor is offering contains the required minimum percentage of post- consumer and recovered material content as shown in the above chart for the product.
- D. MANUFACTURER'S CERTIFICATION: In addition to the Contractor's Certification, a Manufacturer's Certification must be completed and signed by the manufacturer before payment will be made to the Contractor for the delivered items. A Manufacturer's Certification form identical to the form shown below must be used. Contractors are not required to submit the completed and signed Manufacturer's Certification form with their bid or proposal. The Commonwealth shall have no obligation to pay for the item(s) until a properly completed and signed manufacturer's certification is submitted for the delivered item.
- E. ENFORCEMENT: The Contractor may be required, after delivery of the landscaping product(s), to provide the Commonwealth with documentary evidence that the landscaping product(s) were in fact produced with the required minimum percentage of post-consumer and recovered material content.

MANUFACTURER CERTIFICATION

(To be submitted with invoice for each order)

TO BE COMPLETED BY MANUFACTURER:

NAME OF MANUFACTURER: \_\_\_\_\_

ADDRESS OF MANUFACTURER: \_\_\_\_\_

FEDERAL EMPLOYER I.D. NO.: \_\_\_\_\_

CONTRACT OR REQUISITION NO. \_\_\_\_\_

NAME OF CONTRACTOR: \_\_\_\_\_

ADDRESS OF CONTRACTOR: \_\_\_\_\_

Type of landscaping product(s) which the manufacturer furnished to the contractor: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

**CERTIFICATION:** I, the undersigned officer of the above-named manufacturer, do hereby certify that I am authorized to provide this certification on behalf of the above-named manufacturer and that the type of construction product(s) listed above which my company furnished to the contractor named above for the referenced contract or purchase requisition, contained not less than \_\_\_\_\_% post-consumer materials and \_\_\_\_\_% recovered materials as those terms are defined in the invitation for bids. I understand that this document is subject to the provisions of the Unsworn Falsification of Authorities Act (18 Pa C.S. § 4904).

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Name of Signatory

\_\_\_\_\_  
TITLE

\_\_\_\_\_  
DATE

SECTION 49. CONSTRUCTION PRODUCTS RECYCLED CONTENT.

- A. REQUIREMENT: All construction products offered by the Contractor, or included in the final product offered by the Contractor and sold to the Commonwealth must contain the minimum percentage of postconsumer and recovered material content as shown in the chart below for the applicable products.
- B. POST-CONSUMER MATERIAL: Material or finished product that has served its intended use and has been diverted or recovered from waste destined for disposal, having completed its life as a consumer item. Post-consumer material is part of the broader category of recovered material.
- C. RECOVERED MATERIAL: Refers to waste materials and by-products which have been recovered or diverted from solid waste, but does not include those materials and by-products generated from, and commonly reused within, an original manufacturing process.
- D. CONTRACTOR'S CERTIFICATION: Contractor certifies that the construction product(s), which the Contractor is offering, contains the required minimum percentage of postconsumer and recovered material content as shown above for the product.
- E. MANUFACTURER'S CERTIFICATION: In addition to the Contractor's Certification, a Manufacturer's Certification must be completed and signed by the manufacturer before payment will be made to the Contractor for the delivered items. A Manufacturer's Certification form identical to the form shown below must be used. The Contractor is not required to submit the completed and signed Manufacturer Certification form with their proposal. The Commonwealth shall have no obligation to pay for the item(s) until a properly completed and signed manufacturer's certification is submitted for the delivered item.
- F. ENFORCEMENT: The Contractor may be required, after delivery of the construction product(s), to provide the Commonwealth with documentary evidence that the construction product(s) were in fact produced with the required minimum percentage of post-consumer and recovered material content.

Construction Products	MATERIAL	% of Post-Consumer Materials	% of Total Recovered Materials
Structural Fiberboard	Recovered Materials	-	80
Laminated Paperboard	Post-consumer Paper	100	-
Rock Wool Insulation	Slag	-	75
Fiberglass Insulation	Glass Cullet	-	20
Cellulose Insulation (loose-fill and spray-on)	Post-consumer Paper	75	-
Perlite Composite Board Insulation	Post-consumer Paper	23	-
Plastic Rigid Foam, Polyisocyanurate/ Polyurethane: Rigid Foam Insulation	Recovered Material	-	9
Foam-in-Place Insulation	Recovered Material	-	5
Glass Fiber Reinforced Insulation	Recovered Material	-	6
Phenolic Rigid Foam Insulation	Recovered Material	-	5
Floor Tiles (heavy duty/commercial use)	Rubber Plastic	90 -	- 90
Patio Blocks	Rubber or Rubber Blends Plastic or Plastic Blends	90 -	- 90

Polyester Carpet Fiber Face	Polyethylene terephthalate (PET) resin	25	-
Latex Paint: --Consolidated <sup>1</sup> --Reprocessed <sup>2</sup> ----White, Off-White, Pastel Colors ----Grey, Brown, Earthtones, and Other Dark Colors	Recovered Material  Recovered Material Recovered Material	100  20 50	-  - -
Shower and Restroom Dividers/Partitions:	Plastic Steel <sup>4</sup>	20 16 67	- 9 33
Carpet Cushion: --Bonded Polyurethane --Jute --Synthetic Fibers --Rubber	Old Carpet Cushion Burlap Carpet Fabrication Scrap Tire Rubber	15 40 - 60	- - 100 -
Railroad Grade Crossing Surfaces --Concrete --Rubber <sup>3</sup> --Steel <sup>4</sup>	Coal Fly Ash Tire Rubber Steel	- - 16 67	15 85 9 33

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<sup>1</sup> Consolidated latex paint used for covering graffiti, where color and consistency of performance are not primary concerns.

<sup>2</sup> Reprocessed latex paint used for interior and exterior architectural applications such as wallboard, ceiling, and trim; gutterboards; and concrete, stucco, masonry, wood, and metal surfaces.

<sup>3</sup>The recommended recovered materials content for rubber railroad grade crossing surfaces are based on the weight of the raw materials, exclusive of any additives such as binders or additives

<sup>4</sup> The recommended recovered materials content levels for steel in this table reflect the fact that the designated items can be made from steel manufactured from either a Basic Oxygen Furnace (BOF) or an Electric Arc Furnace (EAF). Steel from the BOF process contains 25-30% total recovered materials, of which 16% is post-consumer steel. Steel from the EAF process contains a total of 100% recovered steel, of which 67% is post-consumer.

MANUFACTURER CERTIFICATION

(To be submitted with invoice for each order)

TO BE COMPLETED BY MANUFACTURER:

NAME OF MANUFACTURER: \_\_\_\_\_

ADDRESS OF MANUFACTURER: \_\_\_\_\_

FEDERAL EMPLOYER I.D. NO.: \_\_\_\_\_

CONTRACT OR REQUISITION NO. \_\_\_\_\_

NAME OF CONTRACTOR: \_\_\_\_\_

ADDRESS OF CONTRACTOR: \_\_\_\_\_

Type of construction product(s) which the manufacturer furnished to the contractor: \_\_\_\_\_

CERTIFICATION: I, the undersigned officer of the above-named manufacturer, do hereby certify that I am authorized to provide this certification on behalf of the above-named manufacturer and that the type of construction product(s) listed above which my company furnished to the contractor named above for the referenced contract or purchase requisition, contained not less than \_\_\_\_\_% post-consumer materials and \_\_\_\_\_% recovered materials as those terms are defined in the invitation for bids. I understand that this document is subject to the provisions of the Unsworn Falsification of Authorities Act (18 Pa C.S. § 4904).

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Name of Signatory

\_\_\_\_\_  
TITLE     DATE

SECTION 50. STORAGE ENCLOSURE. The Contractor shall provide, at its cost, a suitable, substantial and watertight storage enclosure in which it shall store all materials that might be damaged by the weather. A Mobile trailer type is acceptable. The Contractor is responsible for maintaining and removing this enclosure at its cost. All storage enclosures shall be of sufficient size to hold all the Contractor's subject materials on the site at one time and shall have floors raised at least six (6) inches above the ground on heavy joists or sleepers. Storage enclosures shall have sufficient natural ventilation to preclude condensation.

SECTION 51. NO STORAGE IN EXISTING BUILDINGS. The Contractor shall not store any materials in any existing building or beyond the contract limits as defined by the drawings without prior authorization from the Department.

SECTION 52. RECORD DRAWINGS. At the time of Final Inspection, the Contractor shall use the Submittal Process to submit to the Professional a complete set of contract color prints in PDF format, corrected with suitable markings to show all changes or variations from the original contract, including all items uncovered during the work and showing the details of the work as actually built, including but not limited to horizontal and vertical dimensional references of all concealed pipe, conduit and other lines and equipment.

SECTION 53. IF LETTER OF INTENT ISSUED. If the Department elects to issue a Letter of Intent pursuant to §906 of the Commonwealth Procurement Code, the Letter will list and describe the Work that can commence prior to the Effective Date of Contract.

SECTION 54. COMMENCEMENT OF OFF-SITE WORK IF LETTER OF INTENT NOT ISSUED. If the Department does not issue a Letter of Intent, the date of commencement of Off-Site Work is the Effective Date of Contract.

SECTION 55. SUBMITTALS.

- A. A Submittal Register, which is a listing of the submittals needed for the Project, will be created by the Professional and uploaded for the Contractor's use. The Contractor will use this Submittal Register when creating their Submittal Schedule. The Professional's Submittal Register shall serve as the basis of the Prime Contractor's Submittal Schedule and is not by any means an all-inclusive list of submittals required for the project. The Contractors are responsible for reviewing all Contract Documents to fully develop an all-inclusive list of required submittals for the project and utilizing that list when creating the Submittal Schedule.
- B. The Contractor shall review the Professional's Submittal Register and submit all necessary submittals, whether or not listed on the Submittal Register, through the Submittal Process to the Professional for review and approval. The Professional shall then forward all approved submittals to the Department and consultants with the Submittal Schedule
- C. Submittals shall be in accordance with the Contract Documents and include, but not be limited to, such items as:
  1. Contractor's, Subcontractor's, manufacturer's or fabricator's shop drawings.
  2. Descriptive literature including, but not limited to:
    - a. Catalog cuts
    - b. Diagrams
    - c. Operation charts or curves
    - d. Test reports

- e. Samples
  - f. Operations and maintenance manual, including parts lists
  - g. Certifications
  - h. Warranties
  - i. Manufacturer
3. Coordination Drawings as required.
- D. The Professional's approval of submittals does not relieve the Contractor of the responsibility for any deviation from the requirements of the Contract Documents, unless:
- 1. The Contractor has informed the Professional of such deviation in an attachment to their submittal at the time of submission; and
  - 2. The Contractor has noted the deviation on the shop drawings; and
  - 3. The Professional has given approval of the specific deviation. The Professional's approval also does not relieve the Contractor from responsibility for errors or omissions in the submittals. If each of these three steps is not performed, the Contractor will not be relieved of the responsibility for executing the Work in complete conformity with the Contract Documents, even though the submittals have been approved.
- Failure to mention a deviation shall be construed as a non-conformance with the Contract Documents. The Contractor shall be responsible for all costs associated with bringing the Work back into conformance with the Contract Documents, including costs incurred by any other Prime Contractor, the Professional and the Department as a result of such non- conformance.
- E. The Contractor shall review, approve and submit all submittals required by the Contract Documents or required subsequently by the Department or the Professional in accordance with the Submittal Schedule in an orderly sequence so as to cause no delay in its Work or in the Work of any other Prime Contractor. Submittals shall be properly identified as specified in the Administrative Procedures and in such manner as the Department may require.
- F. By approving and submitting submittals, the Contractor represents that such submittals are sufficient for review purposes and that it has determined and verified all field measurements, field construction criteria, materials, catalog numbers and similar data and that it has checked and coordinated each submittal with the requirements of the Work and of the Contract Documents. Where field measurements and field construction criteria are not verifiable at the date of the submittal, the Contractor shall ensure that dimensions will be held when constructed.
- G. Submittals will be reviewed and approved within fourteen (14) calendar days of the submission dates established by the Submittal Schedule, unless the Department and the Professional approve a different period of time. The fourteen calendar days span the time from upload of the submittal by the Contractor to the date the Professional transmits the return submittal. The Submittal Schedule shall take transmittal times into account when time periods are reviewed. Review and approval is only for conformance with the design concept of the Project and with the information given in the Contract Documents. Approval of a separate item does not indicate approval of an assembly in which the item functions. Approval of submittals shall be carried out on the Project in accordance with the Administrative Procedures. All submittals must be complete and meet the requirements of the entire specification. The Prime Contractor shall be responsible for all costs associated with delays of the Project incurred as a result of submittal incompleteness and/or disapprovals.

- H. The Contractor shall make any corrections required and shall resubmit submittals until approved. The resubmission shall be acted upon within ten (10) calendar days of its receipt, unless the Department and the Professional approve a different period of time. The ten (10) day period begins on the first full day after the Contractor uploads the resubmission and ends on the date the Professional sends the resubmission to the Contractor. Submittals uploaded earlier than the date established by the Submittal Schedule are not required to be returned until ten (10) days after the date established for the submittal by the Submittal Schedule.
- I. When resubmitting submittals, the Contractor shall direct specific attention to any revisions made, other than the corrections requested by the Professional on previous submissions, by noting such revisions on the resubmissions.
- J. The Professional's approval of shop drawings or samples does not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents, unless the Contractor has informed the Professional of such deviation at the time of submission, has noted the deviation on the submittals, and the Professional has given approval of the specific deviation. The Professional's approval also does not relieve the Contractor from responsibility for errors or omissions in the submittals. Failure to mention a variation shall be construed as a non-conformance with the Contract Documents. The Contractor shall be responsible for all costs associated with bringing the Work back into conformance with the Contract Documents, including costs incurred by any other Prime Contractor, the Professional and the Department as a result of such non-conformance.
- K. No portion of the Work requiring a submittal shall be commenced until the submittal has been approved. Any Work commenced by the Contractor prior to final approval of the submittal is performed by the Contractor at its own risk.
- L. Any exception taken to the content of another Contractor's approved submittal must be coordinated/resolved between the Contractors within three (3) calendar days of the Contractor's approved submittal. If the exception cannot be coordinated/resolved, it must be presented to the Professional through the RFI process within seven (7) calendar days of the Contractor's approved submittal.

SECTION 56. SUBMITTAL SCHEDULE.

- A. Each Contractor shall, within seven (7) days of the Effective Date of the Contract review the Professional's Submittal and prepare and submit a Submittal Schedule with all necessary submittals, whether or not listed on the Submittal Register, to the Lead Contractor, organized by related specification section number sequences, showing all items requiring submission. The Submittal Schedule shall be submitted as prescribed by the Administrative Procedures.
- B. The Contractor's initial Submittal Schedule shall include the following, at a minimum:
  - 1. Submittal breakdown by Specification Section number and division; and
  - 2. Scheduled date for initial submittal of item; and
  - 3. Days required after return of an approved submittal to order, fabricate and deliver the specific item to the site.
- C. The Submittal Schedule shall be integrated and tied to the logic of activities in the Project Schedule by the Lead Contractor to ensure adequate review time is included in the activity durations for all items on the Submittal Schedule.
- D. Each Contractor shall comply with the Submittal Schedule and submit items within the order and dates established therein. Each Contractor shall not be permitted to stack the submittals in a manner that would inundate the Professional in such a manner that the submittals cannot be reviewed and decided upon in a timely manner.



- E. Submittals relating to materials and equipment that require advanced approval shall be scheduled and submitted before the Contractor issues a purchase order or otherwise acquires the materials or equipment.
- F. Drawings of component items forming a system or that are interrelated shall be organized and submitted concurrently. Certifications to be submitted with the drawings shall be so scheduled. The Submittal Schedule shall be coordinated with the Schedule of Values to ensure delivery and payment requests are projected accurately.
- G. Neither the Department, its designee, nor the Professional will be responsible for the failure of the Contractor to properly schedule the process of material/product design, submittal, review, fabrication, delivery and storage/installation.
- H. The Department may require the Contractor to add and/or delete items on the Submittal Schedule at any time.
- I. The approved Submittal Schedule will become a part of the Contract and the Contractors must comply with it. The Contractor shall provide to the Lead Contractor sufficient information to permit the Lead Contractor to revise and/or update the Submittal Schedule monthly to take into account all changes and coordinate this Submittal Schedule with the Project Schedule. Each such revised edition and/or revision to the Submittal Schedule shall be resubmitted to the Department for approval. This Submittal Schedule shall be coordinated with related submittals of all Prime Contractors.

SECTION 57. COORDINATION AND SEQUENCING OF SUBMITTALS.

- J. The Contractor shall coordinate preparation and processing of submittals with the performance of the Work and the Project Schedule so the Work will not be delayed by the submittal process.
- K. The Contractor shall coordinate and sequence different categories of submittals for the same Work and for interfacing units of Work, so that one will not be delayed by the coordination of the Professional's review with another.
- L. No delay damages or time extensions will be granted for time lost due to late, inadequate or uncoordinated submittals or for the time required to resubmit late, inadequate or uncoordinated submittals.
- M. The Contractor shall be responsible to determine items that will require long lead time to procure. Adequate time shall be allowed for long lead items that require submittals to be made early during the course of the Work in the Submittal Schedule and Project Schedule.
- N. No delay damages or time extensions will be granted for lack of consideration being given to long lead items.

SECTION 58. COORDINATION DRAWINGS.

- O. All Contractors are required to participate in the creation and updating of one complete composite set of Coordination Drawings to pre-plan the installation of General, HVAC, Electrical, Fire Protection, Plumbing and other Work as required.
- P. The Department may consider the completion of Coordination Drawings for each Contract as a condition of approval for any Invoice involving any material or equipment delivered or for any Work by these Contractors.

- Q. The purpose of these Coordination Drawings is to identify coordination problems and interferences prior to installation. The Contractors shall prepare and submit Coordination Drawings for any Work where close coordination is required for installation of products and materials fabricated off-site by separate Contractors, and where limited space availability necessitates maximum utilization of space for efficient installation of different components. Coordination Drawings are required for all equipment rooms, floors, spaces and other areas in which the Work of two or more trades or Contractors is to be installed and in which the potential for conflict or interference exists, or as determined by the Department.
- R. The HVAC Contractor will be the Lead Contractor for purposes of the Coordination Drawings and shall facilitate the Coordination Drawing Process between Prime Contractors.
- S. The HVAC Contractor will prepare background drawings that will be distributed to all of the other Contractors for them to mark-up and return to the HVAC Contractor.
- T. The Coordination Drawings shall:
1. Show the Work of all Contractors impacted; and
  2. Be drawn to a scale not smaller than 1/4" = 1'-0" (30" x 42" sheet size); and
  3. Show clearly in both plan and elevation that all Work can be installed without interference; and
  4. Show the interrelationship of equipment and systems to indicate coordination among trades; and
  5. Indicate required installation sequences; and
  6. Be based on submitted shop drawings and Contract Documents, and include equipment foundations, all equipment, piping, conduit, ductwork, panels, control centers and related appurtenances.
- U. The Department may assist, if requested, in the resolution of conflicts or disputes with locations of Work items found by the Contractors during the preparation of the Coordination Drawings.
- V. The HVAC Contractor will incorporate items indicated on the marked-up drawings onto the background drawings and upload these final Coordination Drawings to e-Builder for other Contractors use. One paper set and one PDF electronic format, in its native software of the Coordination Drawings are to be provided to the Department.
- W. Since the preparation of Coordination Drawings acceptable to the Department is a contract requirement, the cost is to be included in each Contractor's bid.

Any Work installed prior to approval of Coordination Drawings shall be at the Contractor's risk. Subsequent relocation required to avoid interferences shall be made without additional expense or time extensions to the Department.

SECTION 59. STANDARDS OF QUALITY. Where trade names, catalog number and manufacturers of material or equipment are specified, they are mentioned for the purpose of establishing a standard of quality, performance, and appearance, and for establishing a standard for competitive bidding. If the Contractor wishes to utilize material or equipment that they believe is of the same type, but manufactured by others than those named in the specifications, the Contractor shall certify that the material or the equipment is equal in quality, performance and appearance to that mentioned in the specifications. The Contractor shall submit to the Professional and the Department, subsequent to the Award of Contract, a request to install such material or equipment. The Contractor's request shall include a comprehensive description of the material or equipment proposed to be utilized as an equal, including engineering, construction, and dimension and performance data. Within thirty (30) days after receipt of the Contractor's request, the Professional will render a determination to the Contractor, which is final. If the Contractor refuses or fails to proceed in accordance with the Professional's determination, the Department may issue cure or non-conformance notices and/or declare the Contractor in default.

SECTION 60. SUBSTITUTION OF MATERIALS. If the Contractor desires to furnish materials or equipment other than that which is specified, the Contractor shall submit to the Professional a comprehensive description of the material or equipment proposed for substitution, including engineering, construction, dimension, performance and appearance data, along with a statement of the cost involved. The Professional, with the approval of the Department, shall render a determination to the Contractor. If the substituted material or equipment is approved, the Contractor is responsible for any and all costs incurred to implement the substitution and for eliminating any additional time that may be needed as a result of implementing the substitution. If the cost of the substituted item is less than the specified item, the Department is entitled to a credit for the difference between the cost of the substituted item and the item specified.

SECTION 61. SAFETY PRECAUTIONS AND PROGRAMS. The Contractor shall recognize that it is important to business to prevent the occurrence of incidents that lead to occupational injuries or illnesses. The Contractor is responsible for initiating, maintaining and supervising all safety precautions and programs required under its portion of the Work.

SECTION 62. SAFETY OVERVIEW. The Contractor and its subcontractors of all tiers will be responsible for the safety and security of its employees under their control and as to its area of Work.

- X. The Contractor and its Subcontractor(s) of any tier shall be required to have its company Safety Program in place and implemented throughout the duration of the project.
- Y. The Contractor will have a Site Safety Program, maintain injury records as required by OSHA. Upon request by the Department, the Contractor shall make available the Site Safety Program, information on injury logs, safety meetings and their topics, inspection reports and other items concerning Project safety.
- Z. The Contractor will inform the Department of any Federal or State inspection, and the Department will receive copies of all Federal and State inspection reports, citations, penalties, abatement dates, etc.
- AA. All Contractors will give full cooperation to all authorized Inspectors, who may periodically inspect the Project without notice.

SECTION 63. SAFETY OF PERSONS AND PROPERTY. The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury, or loss to:

- BB. All employees involved in the Work and all other persons who may be affected thereby; and

- CC. All the Work and all materials and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of the Contractor or any of its subcontractors of any tier; and
- DD. Other property within the Contract Limits or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction; and
- EE. All areas of the Project site where unauthorized entry or presence would present a potential hazard to the health and safety of trespassers shall be adequately posted to prevent access by unauthorized personnel.

SECTION 64. COMPLIANCE WITH SAFETY LAWS. The Contractor shall comply at all times with all applicable Federal, Commonwealth, and local laws, ordinances, rules, regulations and orders of any public authority having jurisdiction for the safety of persons or property and to protect them from damage, injury or loss. The Contractor shall erect and maintain, as required by existing conditions and progress of the Work, all 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 utilities until the acceptance of all on-site physical work, change order work, and/or demobilization. All areas of the Project shall be hardhat areas. All persons within the Contract Limits are required to be protected by protective helmets in compliance with Occupational Safety & Health Administration (OSHA) requirements.

SECTION 65. EMPLOYEE SAFETY ORIENTATION AND SAFETY MEETINGS.

- FF. Each Contractor and its Subcontractor(s) of any tier shall follow OSHA requirements regarding the recognition and avoidance of unsafe conditions and the regulations applicable to the work environment.
- GG. The Contractor and each Subcontractor shall also provide a company-specific basic site and safety orientation to each individual before they begin Work on the Project. This orientation shall cover general safety rules, potential hazards, site work rules, wearing of protective equipment, etc. The Contractor and each Subcontractor shall keep a record of all attendees and topics discussed.
- HH. The Contractor and each of its subcontractors shall hold weekly Toolbox Talks Meetings at the Project site.

SECTION 66. FIRST AID TREATMENT.

- II. The Contractor shall keep on site a first aid kit supplied according to current regulations and shall have a certified person trained in first aid and CPR to cover those periods outside of normal project working hours.

SECTION 67. EMPLOYEE AND VISITOR DRESS REQUIREMENTS.

- A. This Project shall be a hardhat Project and, all supervisors, employees and visitors shall be required to wear a suitable hardhat while on the Project site.
- B. Other appropriate personal protective equipment shall be provided and worn as required for personal safety and protection.

SECTION 68. EMERGENCY NOTIFICATION. A procedure will be established by each Contractor to provide emergency communications to all individuals on the site. This procedure will not be used to handle routine calls to individuals.

SECTION 69. COMPLIANCE WITH SAFETY REGULATIONS.

C. The Contractor's failure to comply with the safety requirements will be considered as non-compliance with the Contract and may result in remedial action as provided by the Contract.

D. Even though the Department has no duty regarding the Contractor's compliance with safety regulations, if the Department notifies any Contractor of any safety issue, the Contractor shall make all reasonable efforts to correct the condition or act.

If a Contractor or Subcontractor refuses to correct the safety issue, condition or act, the Department, in its sole discretion, may take any other action it deems appropriate.

All costs incurred due to correcting the Contractor's safety issue, condition, or act shall be borne by the Contractor which created the safety issue, condition or act and costs will be back-charged to this Contractor.

E. Each Contractor shall be responsible for payment of all fines and/or claims for damages levied for deficiencies relating to conduct of Contractor's Work.

SECTION 70. EXPLOSIVES. Unless permitted in the specifications, the use of explosives and other hazardous materials or equipment is not permitted for the execution of the Work. If explosives are permitted, the Contractor shall observe the utmost care, performing such Work with experienced personnel and in accordance with all Federal, Commonwealth, local, Departmental, and institutional regulations, so as not to endanger life or property. Rock encountered within five (5) feet of pipelines or buildings shall be removed without blasting. All explosives shall be stored in a secure and safe manner, in strict conformity with all Federal, Commonwealth and municipal regulations and all such storage shall be clearly marked "Dangerous-Explosives" and shall be in the care of competent watchmen at all times. The Contractor shall provide insurance in accordance with the special insurance provision relating to "Blasting". The Contractor shall be responsible for all damages caused by the use of explosives, hazardous materials and/or equipment, and blasting and shall notify the Department of any claims of damage associated with this Paragraph at the time of claim.

SECTION 71. REMEDIATION OF DAMAGES. The Contractor shall remedy all damages or loss to any property caused in whole or in part by the Contractor, any Subcontractor, any sub-subcontractor, or anyone directly or indirectly employed by any of them. If damage or loss is attributable to faulty drawings or specifications or to the acts or omissions of the Department or Professional, and the damage or loss is not attributable to any fault or negligence of the Contractor, then the Contractor shall not provide remediation.

SECTION 72. LOADS. The Contractor shall not load or permit any part of the Work to be loaded so as to endanger the safety of persons or property.

SECTION 73. WORKPLACE DRUG AND ALCOHOL POLICY. The Department is committed to providing a safe workplace for the workers assigned to the Project, promoting high standards of employee health and fostering productivity. Contractor shall establish a drug and alcohol policy for the project with the goal of maintaining a work environment that is free from the effects of the use of illegal drugs and alcohol. Anyone employed at the Project site will comply with the contractor's drug and alcohol policy. The Department reserves the right to amend this procedure upon notice to the Prime Contractor.

1. COMPLIANCE PROCEDURE: The Department reserves the right to audit any drug and alcohol policy program required by this specification to verify compliance results within twenty-four (24) hours of the Department's notification of intent to audit. The Department shall have free right of access to all relevant records of the Prime Contractor and their subcontractors for this purpose, provided such record disclosures are within the scope of the Commonwealth of Pennsylvania's Department

of Health and Human Services guidelines pertaining to confidentiality of employee records. The Contractor's pre-engagement employees who receive a positive test result shall immediately leave the project site. Transportation of employees receiving a positive test result is the direct responsibility of the employing Prime Contractor. Furthermore, pre-engagement employees receiving a positive test result shall not be permitted to return to the project site earlier than ninety (90) days from the date of the positive test. At that time, the employee must be tested again.

**SECTION 74. PROJECT SIGN.** On or before the date of the first regularly scheduled Job Conference (after the Initial Job Conference), the Lead Contractor shall erect, at a prominent location (selected by the Department) a six-foot high by eight-foot wide (6'X 8') sign, well braced, and supported by 4"X 4" posts, identifying the Project under construction. The sign board may be constructed from weatherproof plywood, hardboard, or other smooth face material that will weather and remain intact throughout the Project. A three-inch (3") wood border shall frame the sign. The sign shall be placed with the eight-foot (8') dimension horizontal. The base color of the sign shall be white weatherproof flat paint with red border. Lettering shall be in fast blue block letters and shall conform to the following:

COMMONWEALTH OF PENNSYLVANIA (4" LETTERS MIN.)  
THE DEPARTMENT OF GENERAL SERVICES (4" LETTERS MIN.)

[name], GOVERNOR (3" LETTERS MIN.)  
[name], SECRETARY, DEPT. OF GENERAL SERVICES (3" LETTERS MIN.)  
[name], SECRETARY, DEPT. OF (CLIENT AGENCY) (3" LETTERS MIN.)

PROJECT NO. D.G.S. [number] (3" LETTERS MIN.)  
[building name] (4" LETTERS MIN.)  
[facility name] (3" LETTERS MIN.)

[name]...PROFESSIONAL (3" LETTERS MIN.)

[name]....GENERAL CONTRACTOR (3" LETTERS

MIN.) [name]....HEATING CONTRACTOR (3" LETTERS MIN.)

[name].. PLUMBING CONTRACTOR (3" LETTERS MIN.)

[name]... ELECTRICAL CONTRACTOR (3" LETTERS MIN.)

**NOTE:** For information shown in brackets Contractor shall check with the Regional Director's office for proper data.

Upon Completion of the work, or when directed by the Department, the Lead Contractor shall remove the sign.

The Contractor shall change the names provided on the sign should the individual names change during the course of the project. This shall be done at no additional cost to the Department.

**SECTION 75. FOUNDATIONS FOR MECHANICAL EQUIPMENT.** The HVAC, Plumbing and Electrical Contractors shall furnish and install foundations and supports for all equipment installed under their respective Contracts. Foundations and supports shall include isolation mounting for noisy and vibrating equipment. Each Contractor shall provide sufficient dowels or anchors in bases as required for equipment supplied under its Contract. Such foundations and supports shall not be those concrete slabs or that integral concrete construction noted and dimensioned on the architectural and structural drawings, which are considered the responsibility of the Contractor for General Construction.

**SECTION 76. SANITARY FACILITIES.** The Lead Contractor shall, at its cost, provide and maintain in a clean and sanitary condition, adequate and approved sanitary facilities in accordance with O.S.H.A. requirements. All facilities shall be screened against insects. When directed by the Department, the Contractor shall dismantle and remove these facilities and disinfect as required. Portable chemical toilets approved by the Pennsylvania Department of Health are acceptable. Under temporary field conditions, provisions shall be made to assure not less than one toilet facility is available.

**SECTION 77. SANITARY FACILITIES AFTER LINES INSTALLED.** As soon as soil lines and water lines have been installed inside the building and tested successfully by the Plumbing Contractor, the Plumbing Contractor shall, at its cost, install two (2) lavatories and sufficient number of toilets according to the following table:

NUMBER OF WORKERS	MINIMUM NUMBER OF FACILITIES
20 or Less Workers	1
21 or More Workers	1 toilet seat and 1 urinal per 40
200 or More Workers	1 toilet seat and 1 urinal per 50

These shall be kept in working order by the Plumbing Contractor and in a clean and sanitary condition by the Lead Contractor. All supplies for these facilities shall be provided and restocked by the Lead Contractor.

**SECTION 78. HOISTING FACILITIES.** The Contractor for General Construction shall erect, maintain and operate at its cost, hoisting facilities. In the event the hoisting facilities provided by the General Contractor are not available or are unable to accommodate the needs of other Prime Contractors, each Prime Contractor must provide hoisting facilities for its own work. All hoisting facilities must comply with the safety regulations of the Department of Labor and Industry.

**SECTION 79. TEMPORARY VENTILATION.** The Contractor shall provide temporary ventilation to remove from the structure any excessive heat and/or humidity in enclosed portions of the Work, resulting from its construction operations so that the Work may be carried on without interruption and under correct conditions, including required dryness for installation of the various materials. Removing any dangerous or noxious fumes or particles suspended in the air is the responsibility of the Contractor whose construction operations caused these conditions to exist. Temporary equipment used for this temporary ventilation shall produce no hazard to the Work or to any person in or near it. The Contractor shall furnish all such temporary equipment; pay all costs for it and for its operation, including fuel and power supplies during operation both in and out of normal working hours. The Contractor shall remove the equipment when it is no longer required, or when so directed by the Department.

**SECTION 80. WORK BEYOND LIMIT OF CONTRACT.** For purposes of performing the Work, the site is defined by the Limit of Contract lines shown on the drawings. The Contractor is responsible for any work performed beyond the limit of Contract.

**SECTION 81. ADVERTISING.** No advertising is permitted within the Work area or adjacent area. This does not apply to corporate vehicles or attire.

**SECTION 82. STORAGE AND STOCKPILING ON ROOFS.** No materials of any type may be stored or stockpiled overnight on roofs.

SECTION 83. AUDIT OF RECORDS. The Department may, at reasonable times and places, audit the books and records of the Contractor. The Contractor shall maintain books and records related to the Contract for a period of three (3) years from the date of final payment. The Contractor shall include a requirement in contracts with subcontractors or suppliers that requires the Subcontractor or Supplier to maintain its records for the same length of time.

SECTION 84. TEMPORARY TRAFFIC CONTROL. The Project site may have active pedestrian, bike or automobile traffic adjacent to site for the entire duration of the Project. If applicable, the Contractors shall incorporate, furnish and implement the following work as part of this Project.

A. TRAFFIC CONTROL – TEMPORARY TRAFFIC CONTROL GUIDELINES (PENNDOT PUBLICATION

213): The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130 and Temporary Traffic Control Guidelines (PennDOT Publication 213) through a Temporary Traffic Control (TTC) zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.

Publication 213 applies to Contractors; utilities; Federal, State, County, township and municipal governments; and others performing applicable construction, maintenance, emergency or utility/permit work on highways or so closely adjacent to a highway that workers, equipment or materials encroach on the highway or interfere with the normal movement of traffic.

SECTION 85. REDUCTION OF NOISE. The Contractor must take reasonable steps to minimize noise and shall perform work in accordance with local noise ordinances. The Contractor shall perform noise-producing work in less sensitive hours of the day or week as directed by the Department. The Contractor shall maintain noise-producing work at or below the decibel levels and within the time periods specified and shall perform construction activities involving repetitive, high-level impact noise only between 8:00 a.m. and 6:00 p.m. unless otherwise permitted by the Department and permissible by local ordinance.

SECTION 86. VISIBLE DUST EMISSIONS. No person shall perform any construction, demolition, excavation, extraction, or other earthmoving activities unless appropriate measures are sufficiently implemented to limit Visible Dust Emissions (VDE) to 20% opacity and comply with the conditions for a stabilized surface area when applicable. The Contractor shall apply sufficient water to building exterior surfaces, and/or unpaved surface areas where equipment will operate to limit VDE to 20% opacity throughout the duration of razing and demolition activities or handling, storage, and transport of bulk materials on-site or off-site. The Contractor shall apply sufficient dust suppressants to unpaved surface areas within 100 feet where materials from razing or demolition activities will fall in order to limit VDE to 20% opacity. The Contractor shall also apply sufficient dust suppressants to unpaved surface areas where wrecking or hauling equipment will be operated in order to limit VDE to 20% opacity.



**PROJECT MANUAL**

**DMVA PROJECT NO.: 42160105**

**For**

**HVAC & EXHAUST  
REPLACEMENT**

**LOCK HAVEN FMS  
CLINTON COUNTY – LOCK HAVEN– PENNSYLVANIA - 17745**

**Tom Wolf, GOVERNOR**

**Date: 13 APRIL 2018**

**DEPARTMENT OF MILITARY AND VETERANS AFFAIRS  
BUREAU OF MILITARY CONSTRUCTION AND ENGINEERING  
BLDG, 0-10, FT. INDIANTOWN GAP, LEBANON COUNTY, ANNVILLE, PA  
Phone: (717) 861-8343 Fax: (717) 861-8583**

SECTION 010100 – SUMMARY OF WORK

PART 1 – GENERAL

1.2 SCOPE OF WORK, GENERAL

- A. The work under this Contract shall generally consist of, but not necessarily limited to, providing all labor, material, devices, tools and equipment required for the renovation and HVAC / Electrical upgrades of the Lock Haven FMS, Clinton County, Pennsylvania. It shall be in total accordance with the specifications and drawings and subject to the terms and conditions.

1.3 PERFORMANCE PERIOD

- A. **Three Hundred** (300) calendar days from Government granted Notice to Proceed.

1.4 WAGE SCALES

- A. Wage Scales ARE REQUIRED to be paid on this Project.

1.5 QUESTIONS DURING BID PROCESS

- A. Direct all questions pertaining to the project as shown and described in the contract documents to both persons listed below.

Ms. Tina Rebuck, Administrative Officer  
Depart. Of Military and Veterans Affairs  
Bldg. 0-47, Fort Indiantown Gap  
Annville, PA 17003  
Email: trebuck@pa.gov  
Ph.: 717.861.8794                      Fax: 717.861.2932

Mr. Raymond Fishburn, Architectural Supervisor  
DMVA, Bureau of Military Construction & Engineering  
Bldg. 0-10, Fort Indiantown Gap  
Annville, PA 17003  
Email: rafishburn@pa.gov  
Ph.: 717.861.8221                      Fax: 717.861.8683

## 1.6 SUBMITTALS

- A. See individual Sections and “SCHEDULE OF MATERIAL SUBMITTALS (AF FORM 66)” included within the project Design Documents.
- B. Submittals shall be forwarded to Department of Military & Veteran’s Affairs; **Division of Engineering and Architecture, Building 0-10, Fort Indiantown Gap, Annville, Pa 17003.**
- C. Each submittal shall include the following:
  - 1. Project number
  - 2. Contract number
  - 3. Related specification section
  - 4. Contractor’s approval stamp
  - 5. Contractors initials and date
  - 6. Area for DMVA-BMCE review stamp
- D. All submittals must be approved by the discipline responsible, DMVA-BMCE **Design Professional** prior to incorporation into the project.

## 1.7 REQUIRED WARRANTIES

- A. Contractor shall provide all required warranties as outlined within the Project Design Specifications and on all included Government AF Form 66’s.

## PART 2 – OUTLINE OF REQUIRED WORK

- 2.1 The work of this project consists of but is not necessarily limited to the following. Detailed requirements of the work are described on the pertinent specification sections and/or shown on the drawings.
  - A. (GENERAL – POINT 1)
    - 1. Prepare and submit all necessary pre-construction documentation as outlined within the project Design Documents.
    - 2. Perform the following tasks as outlined/required within the Project Design Documents:
      - a. Perform selective demolition.
      - b. Construct Entrance ramp
      - c. Construct all new wall framing.
      - d. Install new ceiling
      - e. Renovate restrooms
      - f. Install new cabinets and sink in breakroom
      - g. Install doors and framing.

3. Complete Punch Lists and Final Cleaning.
4. Provide all required closeout documentation and training per the Project Design Documents prior to deeming/granting the project complete.

B. (HVAC – POINT 2)

1. Prepare and submit all necessary pre-construction documentation as outlined within the Project Design Documents.
2. Perform the following tasks as outlined/required within the Project Design Documents:
  - a. Demo existing HVAC equipment & duct work.
  - b. Install new HVAC equipment, concrete pads, duct work & accessories.
  - c. Install controls for new equipment & connect to existing BMS.
3. Complete Punch Lists and Final Cleaning.
4. Provide all required closeout documentation and training per the Project Design Documents prior to deeming/granting the project complete.

C. (PLUMBING – POINT 3)

1. Prepare and submit all necessary pre-construction documentation as outlined within the Project Design Documents.
2. Perform the following tasks as outlined/required within the Project Design Documents:
  - a. Demo existing plumbing fixtures & equipment.
  - b. Selective demo of piping to accommodate new fixtures & equipment.
  - c. Install new fixtures & equipment.
  - d. Install new piping as required for new fixtures & equipment.
  - e. Install 2 Department provided propane tanks on existing concrete pad.
  - f. Install new LP gas piping (underground, aboveground exterior and interior).
  - g. Provide & install new water sub meter. (Coordinate with HVAC contractor to integrate into BMS).
  - h. Provide & install new stationary monitor for LP gas tanks. (Coordinate with HVAC contractor to integrate into BMS).
3. Complete Punch Lists and Final Cleaning.

4. Provide all required closeout documentation and training per the Project Design Documents prior to deeming/granting the project complete.

B. (ELECTRICAL – POINT 4)

1. Prepare and submit all necessary pre-construction documentation as outlined within the Project Design Documents.
2. Perform the following tasks as outlined/required within the Project Design Documents:
  - a. Install new electrical service, power distribution disconnects, and panel boards.
  - b. Install new conduit and wiring for emergency and exit lighting.
  - c. Install new conduit and wiring for receptacles, HVAC equipment and data outlets.
  - d. Install emergency and exit lighting fixtures.
  - e. Install receptacles, data outlets and make final connections to HVAC equipment.
  - f. Test all systems and adjust as required.
3. Complete Punch Lists and Final Cleaning.
4. Provide all required closeout documentation and training per the Project Design Documents prior to deeming/granting the project complete.

**END OF SECTION 010100**

## SECTION 010400 - COORDINATION AND CONTROL

### PART 1 - GENERAL

#### 1.2 SUMMARY

- A. This section includes the on-site provisions that govern the performance of the work to complete this project.

#### 1.3 CONTRACTS – FOR THIS PROJECT CONSTRUCTION

- A. General Construction (Lead Contractor)
- B. HVAC Construction
- C. Plumbing Construction
- D. Electrical Construction

#### 1.4 COORDINATION

- A. The General Contractor shall be responsible for coordination between all contracts.
  - 1. Construction operations shall be coordinated to ensure efficient and orderly installation of each part of the work.
  - 2. Coordinate installation of different components with other Contractors to ensure accessibility for required construction operations.
  - 3. Make necessary provisions to accommodate items scheduled for later installation.

#### 1.5 VISIT TO SITE

- A. For access to the site during the bidding period contact the Using Agency site personnel with phone number listed below:
  - 1. Using Agency Site Representative: **Larry Campbell**
  - 2. Telephone Number: **717.821.3333**

#### 1.6 UNIDENTIFIED HAZARDOUS MATERIALS (ASBESTOS, CHEMICALS, ETC.)

- A. There is a possibility that hazardous materials not identified in the contract documents may be discovered on this project. Should it be determined that some or all of the hazardous materials must be removed, the Contractor shall obtain an estimate for said removal from a Subcontractor who is experienced in the field, has insurance and is knowledgeable of the regulations as they apply. The Contractor may provide the estimate itself if it is qualified in

the applicable hazardous materials field. The Department shall consider authorizing a Change Order for the removal of the hazardous material to the extent necessary.

- B. The Contractor or Subcontractor must comply with all requirements within the contract documents including the maintenance of insurance up to the limit required in the standard terms and conditions.
- C. Should a hazardous material be encountered on the job, the Contractor shall comply with all statutes and regulations of the Commonwealth of Pennsylvania and all rules and regulations of the United States Environmental Protection Agency as they apply during construction and demolition work and the disposal of hazardous material. Particular attention is drawn to Code of Federal Regulations, Title 40, Part 61, Section 112 of Clean Air Act and PA Department of Labor and Industry, Act 194 for asbestos.
- D. The Contractor shall comply fully with the regulations of OSHA as they pertain to the protection of workers exposed to the emission of asbestos fibers, chemicals, etc. and shall take all steps necessary to protect its employees, as well as all other people engaged in the building.
- E. Whenever a hazardous material is to be removed or disposed of, the Contractor is required to make proper notification to the Bureau of Air Quality Control in the Department of Environmental Protections' Regional Office, PA Department of Labor and Industry and EPA as applicable and is required to obtain and pay for any permits required. Disposal shall conform to all applicable regulations; and documentation shall be required, when applicable.

#### 1.6 LEAD PAINT

- A. The Contractor shall perform the work with the assumption that all painted surfaces are lead-containing. Each Prime Contractor is responsible for following all required OSHA 1926.62 'Lead In Construction' standards when disturbing or impacting these painted surfaces during the course of the renovations, including but not limited to activities such as: cutting and patching, core drilling, penetration, anchoring, fastening, etc. The area(s) shall be visually clean upon completion of any of these activities.
  - 1. Action Plan: Contractor(s) shall submit an Action Plan (that conforms to Paragraphs 1.6 A, A.1., A.2., and A.3.) to the Department at the Initial Job Conference, which specifically outlines details of means and methods to be used for each dust-generating activity involving lead-painted surfaces. Include erection of critical barriers and plastic sheeting for dust control, subsequent exposure assessment, personal protective equipment, hygiene and clean-up for demolition, and selective demolition (large area disturbances).
  - 2. Contractor(s) shall utilize means and methods that preclude uncontained dust generation to complete work that disturbs/impacts lead-containing paint (i.e., waxpaper cup filled with shaving cream, paint stripper, HEPA-assisted drills, etc.) for minor area disturbances.
  - 3. Contractor(s) shall ensure areas beyond work area are not contaminated and shall immediately stop work and erect plastic sheeting to prevent the spread of dust, anytime means and methods inadvertently create dust.

#### 1.7 MOLD

- A. In the event mold is encountered, the Contactor shall implement corrective actions to protect workers, other building occupants, and to prevent the disturbance of mold in affected areas. Although not presently regulated by EPA and/or OSHA, the EPA does provide industry standards regarding worker safety and abatement procedures, which are the minimum procedures to be followed if mold is encountered.
- B. Any mold that appears as a result of construction shall be abated immediately by the Contractor responsible for this condition. The affected surface shall be cleaned, removed, and replaced. Inspection and testing shall be done by a qualified testing agency to confirm the mold has been removed in its entirety.

#### 1.8 TESTING OF EQUIPMENT

- A. After any equipment furnished under the contract and any permanent heating, ventilating, plumbing, drainage or electrical systems and equipment have been installed or modified, it shall be the responsibility of the Contractor to operate its equipment for a satisfactory period of time, as required by the Department for proper testing and instructing the operating personnel. Fuel, electricity and water required for proper testing of permanent equipment and for the period of instructing personnel, shall be paid for by the Contractor testing its equipment.

#### 1.9 INSTRUCTIONS AND TRAINING

- A. Refer to General, as specified in the applicable technical portion of each specification for “Operations and Maintenance Instruction Manuals” and “As-Built Drawing” requirements.

#### 1.10 GENERAL

- A. All construction trailers, offices, equipment and materials required to be on-site shall be located at the direction of the Department. It shall be the responsibility of each Contractor to provide, maintain, and remove all facilities and equipment necessary for construction operations for individual Contracts. All restoration required due to contract operations, shall be the responsibility of each individual Contractor for his location/area of operation, at no expense to the Department. Where there is conflict with responsibility, the General Contractor shall be responsible for restoration, at no cost to the Department.
- B. These items include, but are not limited to:
  - 1. Costs and use charges associated with the facility.
  - 2. Plug-in cords, power cords, and extension cords, power tools.
  - 3. Task lighting and special lighting necessary for construction operation.
  - 4. Storage and fabrication structures/areas.
  - 5. Temporary enclosures for construction activities.
  - 6. Hoisting equipment for construction activities.
  - 7. Waste disposal facilities, including collection and legal disposal of its own waste.
  - 8. Daily cleaning of work area.
  - 9. Secure lockup of tools, materials, and equipment.
  - 10. Construction aids, services, and facilities necessary for individual construction activities.



#### 1.11 WORK IN OCCUPIED BUILDINGS - Interior work

- A. The Contractor shall install dust-tight temporary partitions isolating the work area(s) from the other portions of the building before any interior work begins. These portions must allow access to means of egress in compliance with fire codes.
- B. Protect all existing equipment and finishes remaining in the work area(s).
- C. Where isolated work must be performed outside the partitioned work area(s), the Contractor shall provide temporary dust/dirt protection for its work. Those areas shall be cleaned by the Contractor before its employees leave the area.

#### 1.12 WORKING HOURS

- A. The Contractor's available working hours shall be from 7:00 A.M. to 4:30 P.M., Monday through Friday, and non-holidays. The actual approved working hours will be established, by the Department, at the Initial Job Conference, in accordance with the Using Agency's standard operating schedule.
- B. Work during different hours, or work on Saturdays, Sundays, State and National Holidays or overtime work, must have the Regional Director's or his designee's prior written approval.
- C. This shall not apply in those unforeseen isolated and/or emergency instances when a particular operation must be performed in a continuous sequence that extends the working day beyond the approved working hours. Coordinate with the Department in these instances.
- D. The Department's failure to approve different working hours, weekend or holiday working hours, or overtime hours is not cause for a claim against the Department for delay.

#### 1.13 DELIVERY, STORAGE AND HANDLING

- A. Prefinished materials shall arrive at job site in their original unopened cartons or other protective packaging necessary to protect finishes. Materials should be stored in such packages until time of application. Flat materials such as panels shall arrive and remain on adequate support to ensure flatness and prevent damage.
- B. Store all materials, equipment and bulk items prior to installation in clean, dry, well ventilated locations away from uncured concrete, masonry or from damage of any kind. Waterproof tarpaulin or polyethylene sheeting must allow for air circulation under covering.
- C. Coordinate storage location with Department.
- D. Refer to each section for specific delivery, handling and storage instructions of items specified.

#### 1.14 PARKING

- A. Limited parking space is available on the Commonwealth property. Any parking is subject to prior approval of the Department. Location of Contractor parking shall be coordinated at the pre- construction meeting by the Using Agency.

#### 1.15 TRAFFIC

- A. The Contractor shall establish with the Department at the Initial Job Conference a construction staging and traffic plan for the project which minimizes the construction interferences with the facility's operation. This plan is subject to the Department's approval.

#### 1.16 ENVIRONMENTAL QUALITY CONTROL

- A. The Prime and its Subcontractors shall perform their work in a manner which shall minimize the possibility of air, water, land and noise pollution, in accordance with Section 6.37.
  
- B. The name, address and telephone number of the Department of Environmental Protection District Office is furnished below. This office shall be contacted for waste disposal permits and for information concerning sites already approved for conducting waste disposal.

Luzerne County:

NorthEast (Wilke-Barre) Regional Office  
2 Public Square  
Wilke-Barre, PA 18701  
Phone: (570) 826-2511

#### 1.17 OFFICE FOR CONTRACTOR

- A. The Contractor shall provide and maintain, at its cost, a suitable office on the premises, if so desired by the Contractor. Contractor shall locate the office at direction of the Department

#### 1.18 SMOKING POLICY

- A. Smoking and use of smoke-less tobacco are strictly prohibited in all buildings.

#### 1.19 CONCRETE AND EARTHWORK

- A. All Contractors shall perform concrete work and earthwork required for their work, and shall comply with applicable Division 2 and 3 sections therefore. If any specification section contains language conflicting with requirements of applicable Division 2 and 3 sections, the most stringent requirements shall prevail.

#### 1.20 MILITARY SECURITY REQUIREMENTS

- A. The Contractor shall be responsible for creating, updating and revising a typed list of all employees on site, along with a copy of each individual's photo identification. The list and copies of identification will be revised and updated as construction progresses. A copy of the list and copies of identification will be provided to the Department's representative, listed in 1.5 at the pre-construction conference and be available for inspection at all times during the contract period. All updates to the original list and photo identifications will be

delivered to the Using Agency representative 3 days prior to those individuals entering the project site.

#### 1.23 SANITARY FACILITIES

A. Section 19.3 is hereby deleted the following conditions shall pertain:

1. Sanitary facilities will, within the limitations of the existing facilities, be provided by the Client Agency at no cost. The Lead Contractor shall provide all supplies and maintain the facilities in a clean and sanitary manner at all times.
2. The existing facilities available for the Contractor's use will be assigned by the Department at the Initial Job Conference.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 010400

## SECTION 013300 - SUBMITTALS

### PART 1 - GENERAL

#### 1.2 SECTION INCLUDES/CONTENT

- A. Included in this section of the specifications is a list of approvals required for all materials incorporated into the project. The Department reserves the right to require additional approvals if necessary. No material, equipment or supplies listed herein shall be incorporated into the work until the Contractor has obtained prior approval from the Department.
- B. Submittals required by each prime contract are indicated within AF Form 66 "Schedule of Material Submittals" attached to the end of Section 013300.

#### 1.3 SUBMITTAL PROCEDURES

- A. Refer to 'Submittals' .
- B. Comply with the following or resubmission will be required:
  - 1. Indicate contract number, specification section and building number (as shown on the drawings) on each item submitted.
  - 2. Signify approval by stamp, initialing and dating each item prior to submission to the Professional.
- C. Items requiring testing shall be forwarded directly to the approved laboratory. The Contractor shall pay all costs associated with testing.
- D. Expedite critical materials, equipment and shop drawings, and other required submissions.
- E. Incomplete submissions will be returned for resubmission.
- F. Use of substitutions for materials, details shown on the contract drawings or called for in these specifications requires written approval from the Department. See Instruction to Bidders.

#### 1.4 PRODUCT DATA

- A. Manufacturer's printed directions and manufacturer's standard specifications showing all dimensions, cuts, finishes, etc., as well as catalog cuts and ratings of all material will be required and shall be submitted in advance prior to application and/or installation.

## 1.5 TESTS

- A. Refer to 'Tests' of the Instruction to Bidders.
- B. Submit required reports listing items tested, tests conducted, and results obtained as specified.

## 1.6 CERTIFICATIONS

- A. Submit required certifications in written form identifying authorized representative, manufacturer, systems designer and other required data as specified.

## 1.7 WARRANTIES

- A. Refer to Specifications for required warranties. Copies of proposed warranties specified for products shall accompany the designated submittal of that product.

## 1.8 OPERATION AND MAINTENANCE MANUALS

- A. Manual Format (Use 3-ring binder):
  - 1. Title page with the following information for each system covered:
    - a. Project Title and DGS Contract Number (in capital letters)
    - b. Name of Company
    - c. Name of the individual to be called
    - d. Normal telephone numbers
    - e. Contractor's account number for project
  - 2. Index listing all sections of the Manual.
  - 3. Warranties for equipment furnished in contract. (Index tabbed)
  - 4. Complete system circuit diagrams, block diagrams, copies of all approved shop drawings, which shall clearly illustrate how all the components relate and how they are interconnected and a point wiring diagram.
  - 5. Reports, testing analysis.
  - 6. Operating instructions and maintenance instructions for all equipment and finish materials furnished.

## 1.9 SUBMITTAL LIST

- A. See attached AF Form 66 "Schedule of Material Submittals" for complete list of requested submissions.

PART 2 - PRODUCTS [Not Used]

PART 3 - EXECUTION [Not Used]

**END OF SECTION 013300**

SECTION 014000  
QUALITY CONTROL TESTING

PART 1 - GENERAL

1.2 GENERAL

- A. The Contractor is responsible for verifying and enforcing compliance with all requirements of the contract documents. Contractor's responsibility includes but is not limited to the following:
1. Supervision of field work to enforce contract compliance of all construction activity.
  2. Performance of all necessary field testing to verify compliance with requirements of the plans or specifications requiring adherence to measurable standards of field performance.
  3. Engaging an independent testing laboratory to perform tests as required by each specification section.
  4. Providing support services for all Quality Control Testing, including cutting and patching and repair or replacement as required.
  5. Verification of compliance with plans and specifications of all manufactured materials or equipment. Provide certificates of compliance, or other approved proof of compliance, by the manufacturers of same and submit to the professional whenever requested.
  6. All activities noted heretofore and amplified hereafter shall be considered Quality Control Services.
- B. Work not included: Quality Assurance Testing by the Department is specified in Section 014000. The Department reserves the right to perform tests under the Quality Assurance Testing program and to use those as the basis for approval or rejection at its sole discretion.

1.3 DESCRIPTION OF QUALITY CONTROL TESTING

- A. Quality Control Services include inspections, tests and reports by an independent testing laboratory or other approved agency, hereafter referred to as the Quality Control Agency. All Quality Control Services shall be at the Contractor's cost, which shall be included proportionally in all items of payment or contained in any Base Bid or Unit Price on the Proposal. Tests and Inspections are to include those specifically required by this section

and the technical sections. This responsibility is allowed by agreement with the Department of Labor and Industry. Testing and Inspection will be performed under the oversight of the Quality Assurance Agency, in accordance with requirements of Section 01401.

- B. The Quality Control Agent shall submit a Testing and Inspection Plan to the Professional for its approval, and the approval of the Quality Assurance agent for structure and for soils. The Plan shall be organized according to the requirements of Chapter 17, and chapters referenced in Chapter 17 of the international Building Code (IBC). If any tests or inspections are required that are greater than those in the IBC, they shall be so noted. The approved Plan shall become the organizing document which the QC Agent shall use to develop a system of logging test report designations and dates. This continuous log document shall be regularly distributed by email to Department and contractual parties on the distribution list that receive test and inspection reports.
- C. Quality Control Services by a Quality Control Agency or Agencies is intended to assist in the determination of probable compliance of the work with requirements specified or indicated and do not relieve the Contractor of the responsibility for compliance with Contract Document requirements.
- D. Specific testing or inspections of a structural nature required to be performed by independent Quality Control Agencies for individual construction activities are specified in this Section only. If testing or inspection requirements appear in this section and a technical section, the most stringent requirements shall prevail. If Quality Control Testing or Inspection is specified in a technical section and not in this section, it shall be required as if specified in this section. If Contract Document test requirements are exceeded by IBC requirements, IBC requirements shall prevail. Non-structural tests and inspections are in the technical specifications.
- E. Inspections, tests and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Documents requirements.
- F. Quality Control Services required by the local municipality or other governing authorities are the responsibility of the Contractor, regardless of whether or not specified hereinafter or in the applicable specification section.
- G. Unless specifically stated otherwise, all tests listed in the specifications shall be the responsibility of the Contractor. Statements such as "test as requested by" or "as directed by" the Department of the Professional shall not be construed to indicate that the test is the responsibility of the Department.
- H. Each prime Contractor will pay for all costs in connection with its Quality Control Services. Whenever the word "Contractor" is used it shall be interpreted to mean Prime Contractor or Contractors as applicable. All Contractors performing work for which testing or inspection is required by this section are required to perform said tests/inspections appropriate for the quantity of work performed as indicated by this specification section and as required by all Contract Documents.



PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 RESPONSIBILITIES AND DUTIES OF CONTRACTOR

- A. The Contractor shall engage Quality Control Agencies to provide all Quality Control Services required to comply with the Contract Documents. These services shall be at no cost to the Department.
- B. The Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and indicate non-compliance with Contract Document requirements. Likewise, the Contractor is responsible for retesting when the Department's Quality Assurance Test results prove unsatisfactory. If Quality Assurance Tests were in error, the Contractor shall be reimbursed for his retesting costs.
- C. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility.
- D. Provide the Quality Control Agency with preliminary representative samples of materials to be tested in quantities requested. If the source, quality or characteristics of an approved material changes or indicates lack of compliance with Contract requirements, submit additional samples of materials to the Quality Control Agency.
- E. When requested by the Professional, the Department, or the Quality Control Agency, the Contractor shall immediately provide reports, cutting lists, material bills, shipping bills, time and place of shipment of materials to shop and field and any relevant data on previous testing and investigations of materials.
- F. Provide casual labor and facilities:
  - 1. To provide access to the work inspected or tested by any authorized party.
  - 2. To obtain and handle samples at the site.
  - 3. To facilitate inspections and tests by the QC or QA.
  - 4. For security and protection of samples and test equipment at the project site.
- G. To facilitate the timely sequence of inspection and testing, the Contractor shall give advanced notification to the Quality Control Agency and the Department that work has progressed to a point where inspection and testing may proceed.
- H. Contractor shall pay for additional cost of Quality Control Agency services which, in the opinion of the Professional and the Department, are required because of the following:
  - 1. Failure of materials or workmanship to meet Contract requirements.
  - 2. Materials or practices not complying with the technical specifications which could possibly result in defective and unacceptable work.
  - 3. Changes in source, quality or characteristics of materials.
  - 4. Site cured cylinders requested by the Contractor.

- I. The Quality Control Agency shall submit a certified written report of each inspection, test or similar service to the Design Professional, the Quality Assurance Agent, the Bureau of Construction Regional Director, the BOC Inspector Supervisor, the BOC Field, and the Contractor, with additional copies directly to any governing authority when that authority so directs. All reports shall be submitted within 24 hours of when the inspection, test or similar service was conducted.
- J. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address and telephone number of testing agency.
  - 4. Dates and location of samples and tests or inspections.
  - 5. Names of individuals making the inspection or test.
  - 6. Designation of the Work and test method.
  - 7. Identification of product and specification section.
  - 8. Complete inspection or test data.
  - 9. Test results and an interpretation of test results.
  - 10. Ambient conditions at the time of sample taking and testing.
  - 11. Comments or professional opinion as to whether inspected or tested work complies with Contract Document requirements.
  - 12. Name and signature of Quality Control Agency inspector.
- K. The QC Agent shall cooperate in using standard forms/procedures developed by the Department that assist in accomplishing the tasks required.
- L. Engage independent testing laboratories, whose employees assigned to the Project and tests performed comply with ASTM E 329, Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction. The testing laboratory must be accredited and audited by a qualified national authority. The Contractor is to submit the name and credentials of the proposed QC Agent to the Design Professional and the Department for acceptance.
- M. Upon completion of inspection, testing, sample taking and similar activities, repair the damaged work and restore substrates and finishes to eliminate deficiencies, including deficiencies in the visual qualities of exposed finishes. Comply with the Contract Document requirements for "Cutting and Patching". Protect work exposed by or for Quality Control Testing activities, and protect repaired work.

### 3.2 RESPONSIBILITIES AND DUTIES OF QUALITY CONTROL AGENCIES

- A. Quality Control Agencies engaged to perform inspections, sampling and testing of materials and construction shall cooperate with the Professional, the Quality Assurance Agent, the Department, Labor and Industry, and the Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests. If it is determined by the Department that the personnel provided are not qualified or are not working in the best interests of the Project for the tests performed, the Contractor, through

their Quality Control Agent, shall immediately replace or supplement the subject personnel.

- B. Quality Control Agencies shall notify the Department, the Quality Assurance Agent, the Professional, and the Contractor immediately of irregularities or deficiencies observed in the Work during performance of its services, and take all actions required by Chapter 17 of the IBC.

END OF SECTION

## SECTION 015000 - TEMPORARY UTILITIES

### Part 1 GENERAL

#### 1.2 TEMPORARY SERVICES DURING CONSTRUCTION

- A. The designated Contractor shall install, operate, protect and maintain the respective temporary services as hereinafter specified during the construction of the entire project.
- B. Temporary connections to new and/or existing permanent service lines shall be made at locations as directed by the Department, and when the temporary service lines are no longer required, they shall be removed by the Contractor. Any part or parts of the permanent service lines, grounds and building, disturbed and damaged by the installation and/or removal of the temporary service lines, shall be restored to their original condition by the Contractor responsible for the temporary installation.
- C. If the Contractor fails to carry out its responsibility in supplying temporary services as set forth in this contract it is responsible for such failure and the Department may take such action as it deems proper for the protection and conduct of the work and shall deduct the cost involved from the amount due the Contractor. Only those temporary utilities required for construction need to be extended to the work area(s).

#### 1.3 CONSTRUCTION LIGHT AND POWER

- A. The Electrical Contractor shall install, operate, protect and maintain the temporary service for construction light and power. The Contractor shall extend the temporary wiring throughout the project work areas, properly insulated and installed in accordance with Article 305 of the National Electrical Code. All wiring shall be installed by a licensed electrician.
- B. Existing electrical service can be used to provide power for construction.
- C. The Electrical Contractor shall extend temporary electrical power throughout the building to provide adequate light and power, to the satisfaction of the Department, for the proper conduct of the work as required. The Electrical Contractor shall also provide single-phase, 208-volt power service, if required. As the construction progresses, it shall extend the temporary services to all areas where required, with a minimum of 100W light and duplex power outlet 20' on center minimum and at least in every room or space. The maximum size motor to be used at any power service shall be limited to 5 hp. Construction light and power provided shall fully comply with all provisions for this service of the National Electric Code and OSHA.

- D. Where a service of a type other than that as herein mentioned is required, each Contractor requiring same shall provide such service and necessary equipment at his own expense.

#### 1.4 WELDING

- A. Any Contractor using electrical power for welding on the site shall use self-contained engine generating units.

#### 1.5 FIRE EXTINGUISHERS

- A. Each Contractor shall provide UL listed, NFPA approved fire extinguishers (ten (10) lb. minimum) at the construction site during operations, suitable for all types of fires in accordance with OSHA.

#### 1.6 INTERRUPTION OF SERVICES

- A. Each Prime Contractor shall have all needed equipment and material to complete planned work at the site prior to shutting down any system.

Part 2 PART 2 – PRODUCTS (Not Used)

Part 3 PART 3 – EXECUTION (Not Used)

END OF SECTION

## SECTION 017700 - CLOSEOUT PROCEDURES

### PART 1 - GENERAL

#### 1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary and other Division 1 Specification Sections, apply to this Section.
- B. Additional Division 1 Specifications and Contractual Requirements included within the Project Package per the PA Department of Military and Veteran's Purchasing Department and/or the United States Fiscal and Property Office's Purchasing and Contracting Division.

#### 1.3 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Inspection procedures.
  - 2. Warranties.
  - 3. Final cleaning.
- B. Related Sections include the following:
  - 1. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
  - 2. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 3. Divisions 2 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

#### 1.4 SUBSTANTIAL COMPLETION (BENEFICIAL OCCUPANCY)

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
  - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
  - 2. Submit specific warranties, workmanship bonds, maintenance service agreements, final

- certifications, and similar documents.
  3. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction, damage or settlement surveys, property surveys, and similar final record information.
  4. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
  5. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  6. Complete startup testing of systems.
  7. Submit test/adjust/balance records.
  8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  9. Advise Owner of changeover in heat and other utilities.
  10. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
  11. Complete final cleaning requirements, including touchup painting.
  12. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Government Design Professional and Government Inspector will either proceed with inspection or notify Contractor of unfulfilled requirements. The Contracting Officer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Design Professional and/or Inspector, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
  2. Results of completed inspection will form the basis of requirements for Final Completion.

## 1.5 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
1. Submit a final Application for Payment according to the Government Contracting Office's "Payment Procedures."
  2. Submit certified copy of Government Design Professional's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by the Design Professional. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Government Design Professional and Inspector will either proceed with inspection or notify

Contractor of unfulfilled requirements. The Contracting Officer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

#### 1.6 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
  1. Organize list of spaces in sequential order, starting with exterior areas first then proceeding on the interior from the Main Entrance clockwise throughout the facility.
  2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
  3. Include the following information at the top of each page:
    - a. Project name.
    - b. Date
    - c. Name of Contractor.
    - d. Page number.

#### 1.7 WARRANTIES

- A. Submittal Time: Submit written warranties on request of the Government Design Professional (per FORM 66's) for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Organize warranty documents within the Project Operation and Maintenance Manuals.

### PART 2 - EXECUTION

#### 2.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:



- a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
- b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
- c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
- d. Remove tools, construction equipment, machinery, and surplus material from Project site.
- e. Remove snow and ice to provide safe access to building.
- f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
- g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
- h. Sweep concrete floors broom clean in unoccupied spaces.
- i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
- j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
- k. Remove labels that are not permanent.
- l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
  - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
- m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- n. Replace parts subject to unusual operating conditions.
- o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- q. Clean ducts, blowers, and coils if units were operated without filters during construction.
- r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
- s. Leave Project clean and ready for occupancy.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of

lawfully.

### PART 3 - PRODUCTS

#### 3.1 MATERIALS

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

**END OF SECTION 017700**

## SECTION 017823 - OPERATION AND MAINTENANCE DATA

### PART 1 - GENERAL

#### 1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Additional Division 1 Specifications and Contractual Requirements included within the Project Package per the PA Department of Military and Veteran's Purchasing Department and or United States Fiscal and Property Office's Purchasing and Contracting Division.

#### 1.3 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory.
  - 2. Emergency manuals.
  - 3. Operation manuals for systems, sub-systems, and equipment.
  - 4. Maintenance manuals for the care and maintenance of products, materials, finishes, systems and equipment.
- B. Related Sections include the following:
  - 1. Division 1 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
  - 2. Division 1 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
  - 3. Divisions 2 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

#### 1.4 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

- B. Subsystem: A portion of a system with characteristics similar to a system.

## 1.5 SUBMITTALS

- A. Final Submittal: Submit one copy of each manual in final form at least 14 days before final inspection. Government Design Professional will return copy with comments within 7 days after final inspection.
  - 1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 7 days of receipt of Architect's comments.

## 1.6 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

## PART 2 - PRODUCTS

### 2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
  - 1. List of documents.
  - 2. List of systems.
  - 3. List of equipment.
  - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

### 2.2 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
  2. Table of contents.
  3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
1. Subject matter included in manual.
  2. Name and address of Project.
  3. Date of submittal.
  4. Name, address, and telephone number of Contractor.
  5. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents per CSI Specifications (Divisions 2-16). Within each organize each Division by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
  2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
  3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
  4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
  5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

- a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
- b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

## 2.3 EMERGENCY INFORMATION

- A. Content: Organize into a separate section for each of the following:
  1. Type of emergency.
  2. Emergency instructions.
  3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
  1. Fire.
  2. Flood.
  3. Gas leak.
  4. Water leak.
  5. Power failure.
  6. Water outage.
  7. System, subsystem, or equipment failure.
  8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
  1. Instructions on stopping.
  2. Shutdown instructions for each type of emergency.
  3. Operating instructions for conditions outside normal operating limits.
  4. Required sequences for electric or electronic systems.
  5. Special operating instructions and procedures.

## 2.4 OPERATION INFORMATION

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
  1. System, subsystem, and equipment descriptions.
  2. Operating standards.
  3. Operating procedures.
  4. Operating logs.

5. Wiring diagrams.
6. Control diagrams.
7. Piped system diagrams.
8. Precautions against improper use.
9. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

## 2.5 PRODUCT MAINTENANCE

- A. Content: Organize into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:

1. Product name and model number.
  2. Manufacturer's name.
  3. Color, pattern, and texture.
  4. Material and chemical composition.
  5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
  2. Types of cleaning agents to be used and methods of cleaning.
  3. List of cleaning agents and methods of cleaning detrimental to product.
  4. Schedule for routine cleaning and maintenance.
  5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

## 2.6 SYSTEMS AND EQUIPMENT MAINTENANCE INFORMATION

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
1. Standard printed maintenance instructions and bulletins.
  2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  3. Identification and nomenclature of parts and components.
  4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
  2. Troubleshooting guide.
  3. Precautions against improper maintenance.



4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  5. Aligning, adjusting, and checking instructions.
  6. Demonstration and training videotape, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

## PART 3 - EXECUTION

### 3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance information.
- B. Emergency Information: Compile complete documentation of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Information: Compile complete documentation of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Information: Compile complete documentation of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
  1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.

2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
1. Do not use original Project Record Documents as part of operation and maintenance manuals.
  2. Comply with requirements of newly prepared Record Drawings in Division 1 Section "Project Record Documents."

**END OF SECTION 017823**

## SECTION 017839 - PROJECT RECORD DOCUMENTS

### PART 1 - GENERAL

#### 1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Additional Division 1 Specifications and Contractual Requirements included within the Project Package per the PA Department of Military and Veteran's Purchasing Department and or United States Fiscal and Property Office's Purchasing and Contracting Division.

#### 1.3 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
  - 1. Record Drawings in CAD Format.
  - 2. Record Specifications.
  - 3. Record Product Data.
  - 4. Project Cost Analysis
- B. Related Sections include the following:
  - 1. Division 1 Section "Closeout Procedures" for general closeout procedures.
  - 2. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 3. Divisions 2 through 33 Sections for specific requirements for Project Record Documents of the Work in those Sections.

#### 1.4 SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1. One (1) Hard Copy of Contractor As-Built Drawings. Drawing Size to be 24"x36".
  - 2. One (1) CD Rom containing CAD based Contractor As-Built Drawings.

- B. Record Product Data: Submit as part of the Project Operation and Maintenance Manuals.
- C. Project Cost Analysis: To be submitted when the Owner takes Beneficial Occupancy.

## PART 2 - PRODUCTS

### 2.1 RECORD DRAWINGS

- A. Record Prints: Contractor to maintain one (1) red-lined set of drawings throughout the duration of the project construction phase. Prior to the substantial completion, contractor shall transfer all red-lined mark-ups to the Government provided CAD drawings.
  - 1. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations below first floor.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made by Change Order or No Cost Field Change.
    - k. Changes made following Government Design Professional's written orders.
    - l. Field records for variable and concealed conditions.
  - B. Preparation: Contractor to transfer all construction red-line mark-ups from the record set onto the Government provided CAD drawings. Government drawings are AutoDesk (AutoCad) format and this format shall be maintained by the contractor.
    - 1. Contractor to create a CAD layer within each Government provided CAD drawing and label it;  
"CONTR\_AS-BUILTS"  
Note: All contractor related As-Built changes shall be contained to this layer.
  - C. Paragraph and subparagraphs below describe a procedure for assembling nearly correct reproducible Drawings. Add requirements for special printing methods on specific material, such as moisture-sensitive prints on mylar film. Delete if not required.
  - D. Record Plans: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Government Design Professional and/or Contracting Officer. When authorized, prepare a full set of corrected transparencies of the Contract Drawings and Shop Drawings.
    - 1. Refer instances of uncertainty to the Government Design Professional for resolution.
  - E. Format:

1. Record Prints: Contractor shall plot one (1) 24"x36" (min.) set of As-Built drawings to submit for review. As-Built set shall be organized and bound per the DMVA-BMCE Cover Sheet. Hardcopy set should contain an "AS-BUILT" stamp located in the lower right-hand corner of each sheet.
2. AutoDesk (AutoCad) Format, Release 2010 (or newer).

## 2.2 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  3. Note related Change Orders, Specifications and Record Drawings where applicable.

## 2.3 PROJECT COST ANALYSIS

- A. Preparation: Each Prime Contractor shall maintain construction cost throughout the duration of the project. The following cost shall be submitted upon the Owner taking Beneficial Occupancy of the facility.
- B. Building Cost: Overall construction cost of the facility, excluding all site utilities. Cost shall incorporate all Change Order amounts into this breakout.
- C. Site Utilities: Contractor shall provide an updated cost and total linear footage for the following site utility installations:
  1. Domestic Water
  2. Sanitary Sewer
  3. Electrical Service
  4. Gas/Propane Service

## 2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submit in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

## PART 3 - EXECUTION

### 3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as

they occur; do not wait until the end of Project.

- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Government Design Professional, Government Inspector and/or Contracting Officer's reference during normal working hours.

**END OF SECTION 017839**

## SECTION 024116 – SELECTIVE DEMOLITION

### PART 1 - GENERAL

#### 1.2 RELATED DOCUMENTS

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

#### 1.3 SUMMARY

- A. Section Includes:

- 1. Demolition and removal of building features, interior finishes, site improvements, etc.

#### 1.4 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged.
- B. Existing to Remain (ETR): Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, salvaged or reinstalled.

#### 1.5 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
  - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

#### 1.6 SUBMITTALS

- A. Qualification Data: For qualified refrigerant recovery technician.

- B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
- C. Schedule of Selective Demolition Activities: Indicate the following:
  - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's on-site operations are uninterrupted.
  - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
  - 3. Coordination for shutoff, capping, and continuation of utility services.
  - 4. Use of stairs.
  - 5. Locations of proposed dust- and noise-control temporary partitions and means of egress, including for other tenants affected by selective demolition operations.
  - 6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
  - 7. Means of protection for items to remain and items in path of waste removal from building.
- D. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

#### 1.7 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- C. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.
- D. Pre-demolition Conference: Conduct conference at Project site.
  - 1. Inspect and discuss condition of construction to be demolished.
  - 2. Review structural load limitations of existing structures.
  - 3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  - 4. Review and finalize protection requirements.
  - 5. Review procedures for protection of adjacent buildings.
  - 6. Review items to be salvaged and returned to Owner.

#### 1.8 PROJECT CONDITIONS

- A. All areas slated to be demolished will be vacated and their use discontinued before start of the Work.
- B. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.



- C. Owner assumes no responsibility for building features and structures to be demolished.
  - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
  - 2. Before demolition, Owner will remove the following items:
    - a. Any and all unit equipment, historical & unit memorabilia, office furniture and office equipment currently be stored within the existing facility.
    - b. Owner will require a minimum of 5 business days notice prior to the start of any demolition work.
- D. Hazardous Materials: Asbestos has been identified in the existing wall panels above hanger doors.
  - 1. Hazardous material remediation is specified elsewhere in the Contract Documents.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
- F. Storage or sale of removed items or materials on-site is not permitted.

#### 1.9 COORDINATION

- A. Arrange demolition schedule so as to minimize interference with Owner's on-site operations or operations of adjacent occupied buildings.

### PART 2 - PRODUCTS (NOT USED)

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.
- B. Review Project Record Documents, if any, of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Perform a pre-demolition survey of existing building conditions to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during the demolition operations.
- D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- E. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Government Design Professional.

### 3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
  - 1. Building manager will arrange to shut off indicated services/systems when requested by Contractor.
  - 2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
  - 3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

### 3.3 PREPARATION/PROTECTION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- B. Existing Utilities: See Divisions 22 and 26 Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.
- C. Existing Facilities: Protect adjacent walkways, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.
- D. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
  - 1. Strengthen or add new supports when required during progress of demolition.
- E. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent areas of the facility to remain.
  - 1. Provide protection to ensure safe passage of people around demolition area and to and from occupied portions of building.
  - 2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during demolition operations.
  - 3. Cover and protect furniture, furnishings, and equipment that have not been removed.
- F. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.
- G. Salvaged Items: Comply with the following:

1. Clean salvaged items of dirt and demolition debris.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to storage area designated by Owner.
5. Protect items from damage during transport and storage.

### 3.4 DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
  2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
  4. Maintain adequate ventilation when using cutting torches.
  5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
  6. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  7. Dispose of demolished items and materials promptly. Comply with requirements in Division 01 Section "Construction Waste Management and Disposal."
- B. Surveys: During demolition, perform surveys to detect hazards that may result from building demolition activities.
- C. Explosives: Use of explosives is not permitted.

### 3.5 DEMOLITION BY MECHANICAL MEANS

- A. Proceed with demolition of structural framing members systematically, from higher to lower level.
- B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.
- C. Below-Grade Construction: Existing foundation walls and other below-grade construction shall remain in-place and disturbance kept to a minimum throughout the demolition phase.

- D. Existing Utilities: Refer to Electrical, HVAC and Plumbing design documents for requirements regarding all existing utilities.

### 3.6 SITE RESTORATION

- A. Prepare site and adjacent areas in accordance with all new construction outlined within the Project Design Documents.

### 3.7 REPAIRS

- A. Promptly repair damage to adjacent areas/surfaces caused by demolition operations.
- B. Existing Slab: Contractor shall repair any and all damage to the concrete slab prior to the beginning of new construction aspects.

### 3.8 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved landfill acceptable to authorities having jurisdiction. See Division 01 Section "Construction Waste Management and Disposal" for recycling and disposal of demolition waste.
  - 1. Do not allow demolished materials to accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Do not burn demolished materials.

### 3.9 CLEANING

- A. Clean adjacent areas, surfaces and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before demolition operations began. Areas that will involve additional demolition operations should be cleaned only to the point that will allow for further work to be conducted in a safe manner.
  - 1. Clean roadways of debris caused by debris transport.

**END OF SECTION 024116**

## SECTION 024120 - CUTTING AND PATCHING

### PART 1 - GENERAL

#### 1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.

#### 1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

#### 1.4 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 5 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
  - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
  - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
  - 3. Products: List products to be used and firms or entities that will perform the Work.
  - 4. Dates: Indicate when cutting and patching will be performed.
  - 5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
  - 6. Facility Construction Maintenance Manager's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

## 1.5 QUALITY ASSURANCE

- A. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:
  - 1. Equipment supports.
  - 2. Piping.
- B. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Government Design Professional's opinion, reduce the building's aesthetic qualities.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
  - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
  - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

### 3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  - 4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  - 5. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
  - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
  - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
  - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even

surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

- a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather-tight condition.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

**END OF SECTION 024120**



SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.2 SUMMARY

- A. This Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
1. Walkways and ramps
  2. Slab-on-grade.

1.3 REFERENCES/ACRONYMS

- A. The following referenced material shall apply to this specification and have the same force and effect as if printed in full herein:
1. ACI = American Concrete Institute
  2. CRSI = Concrete Reinforcing Steel Institute
  3. ASTM = American Society of Testing and Materials
  4. PennDOT = Pennsylvania Department of Transportation

ACI 301-89	Specifications for Structural Concrete for Buildings.
ACI 318	Building Code Requirements for Reinforced Concrete
ACI 347	Recommended Practice for Concrete Formwork
ACI 304	Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete
ACI 305R	Hot Weather Concreting
ACI 306R	Cold Weather Concreting
ACI 302	Recommended Practice for Concrete Floor and Slab Construction
ACI 315	Detail Manual
ACI 308	Standard Practice for Curing Concrete
CRSI	Manual of Standard Practice
CRSI	Recommended Practice for Placing Reinforcing Bars
PennDOT	Publication 408 (latest edition) with supplements
ASTM C 94	Standard Specification for Ready-Mixed Concrete
ASTM C 150	Specification for Portland Cement
ASTM A 497	Standard Specification for Steel Welded Fabric, Deformed for Concrete Reinforcement

ASTM A 185	Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM A 615 A 615M	Standard Specification for Deformed and Plain Billet Steel bars for Concrete Reinforcement
ASTM C 260	Standard Specification for Air-Entrained Admixtures for Concrete
ASTM C 309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

#### 1.4 SUBMITTALS

- A. Make submissions in accordance with Division 1 Specifications and ‘SCHEDULE OF MATERIAL SUBMITTALS’, attached at the end of the Specifications.
- B. No deviations, substitutions or changes of materials, to be incorporated into this project, shall be made after approval by the Department, except for written direction by and the approval of the manufacturer of a specific item and re-approval by the Department.
- C. The Department retains the right to require additional items not specifically denoted to be submitted for approval and/or additional clarification.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
  - 1. Only concrete obtained from PennDOT approved/certified batch plant shall be used in conjunction with this project.
- C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- E. Prior to each pour, contractor shall provide a Concrete Plant Batch Slip for each batch utilized for the given pour. The Batch Slip shall be submitted to the Inspector by the first delivery truck for each batch. The Batch Slip shall contain the following information (at a minimum):
  - 1. Date.
  - 2. Plant Name and Location.
  - 3. Batch Number.
  - 4. Batch Time.
  - 5. Dry materials and weights.

6. Liquids and volumes.
  7. Admixtures and volumes.
- F. Prior to the starting of a pour, concrete delivery drivers shall provide the on-site Inspector with a delivery slip. Delivery slips shall denote the following information:
1. Truck No., Driver's Name, and Batch Plant.
  2. Time stamp for batch and/or time driver left plant.
  3. Concrete Mix.
  4. Batch Slump.
  5. Admixtures.
  6. Time Mixer arrived at Site.

Note: At no time will a driver be granted permission to off-load if a valid delivery slip is not provided.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Water stops: Store water stops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

## PART 2 - PRODUCTS

### 2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
  1. Plywood, metal, or other approved panel materials.
  2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
    - a. High-density overlay, Class 1 or better.
    - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
    - c. Structural 1, B-B or better; mill oiled and edge sealed.
    - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, Bollards and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not

exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

- D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.
- E. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- F. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- G. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
  - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- H. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
  - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
  - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter concrete surface.
  - 3. Furnish ties with integral water-barrier plates to walls indicated to receive damp proofing or waterproofing.

## 2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.
- C. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.
- D. Galvanized-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from galvanized-steel wire into flat sheets.
- E. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884, Class A coated, Type 1, steel wire, with less than 2 percent damaged coating in each 12-inch wire length. (Exterior locations).

## 2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.
- B. Epoxy-Coated Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, ASTM A 775/A 775M epoxy coated. (Exterior locations)

- C. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 775M.
- D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follow:
  - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

## 2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
  - 1. Portland Cement: ASTM C 150, Type I, gray. Supplement with the following:
    - a. Fly Ash: ASTM C 618, Class F.
    - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, graded.
  - 1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
  - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M.

## 2.5 ADMIXTURES

- A. No admixtures will be permitted without prior notification and approval of the Design Professional and/or Inspector.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
  - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A
  - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
  - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
  - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
  - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494 494M, Type G.
  - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

## 2.6 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

## 2.7 FLOOR AND SLAB TREATMENTS

- A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.

## 2.8 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approx. 9oz./sq.yd. when dry.
- C. Moisture Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable (It shall be the contractor's responsibility to verify availability of potable water. If potable water is NOT available at project site, contractor will be responsible for providing water tanks).
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating. Maximum VOC emission of 350 g/L or less. Product shall not interfere with bonding of floor covering where used.

## 2.9 RELATED MATERIALS

- A. Contraction Joint (C.J.)
  - 1. Preformed two-piece plastic strip with a depth of 2".
  - 2. Manufacturer/Catalog Number: W.R. Meadows Sealtight catalog #324, Speed-E-Joint.
- B. Keyed Construction Joint (K.C.J.)
  - 1. ¼" wide by the full thickness of concrete slab asphaltic type with centered key having pre-punched openings at 24" o.c. for steel stakes. Stakes shall be minimum 18 gauge steel, 3/8" channel type by 15" long.
  - 2. Manufacturer/Catalog Number: W.R. Meadows Sealtight catalog #321, Premoulded Tongue and Groove Joint.
- C. Expansion Joint (E.J./E.E.J.)
  - 1. ½" wide by the full thickness of concrete slab, asphaltic self-sealing type and shall conform to ASTM D 994.

2. Manufacturer/Catalog Number: W.R. Meadows Sealtight catalog #320 Asphaltic Expansion Joint.

## 2.10 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
  1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- C. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
  1. Fly Ash: 25 percent.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
  1. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
  2. Use water-reducing, high range water-reducing or plasticizing admixture in concrete as required for placement and workability.
  3. Use water-reducing and retarding admixture when required by high temperature. Low humidity or other adverse placement conditions.
  4. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structural slabs, concrete required to be watertight and concrete with a water-cementitious materials ratio below .50.

## 2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: Proportion normal-weight concrete mixture as follows:
  1. Minimum Compressive Strength: 4000 psi at 28 days.
  2. Maximum Cementitious Materials Content: 0.45.
  3. Slump Limit: 4 inches plus or minus 1 inch.
- B. Foundation Walls, Grade Beams, Column Piers: Proportion normal-weight concrete mixture as follows:
  1. Minimum Compressive Strength: 4000 psi at 28 days.
  2. Maximum Cementitious Materials Content: 0.45.
  3. Slump Limit: 4 inches plus or minus 1 inch.
  4. Air Content: When determined necessary, 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
- C. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
  1. Minimum Compressive Strength: 3500 psi at 28 days.

2. Maximum Cementitious Materials Content: 0.50.
3. Slump Limit: 4 inches plus or minus 1 inch.
4. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.

D. Sidewalks:

1. Minimum Compressive Strength: 3000 psi at 28 days.
2. Maximum Cementitious Materials Content: 0.45.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.

E. Bollards:

1. Minimum Compressive Strength: 3000 psi at 28 days.

## 2.12 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

## 2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

## PART 3 - EXECUTION

### 3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
1. Class A, 1/8 inch for smooth-formed finished surfaces.
  2. Class C, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.



- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
  - 1. Install keyways, reglets, recesses, and the like, for easy removal.
  - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Do not chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### 3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

### 3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
  - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.

- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by the Inspector.

### 3.4 VAPOR RETARDERS

- A. Plastic Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
  - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.

### 3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
  - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

### 3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
  - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
  - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
  - 3. Locate joints for beams, slabs, joists and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

4. Locate horizontal joints in walls at underside of slabs and at the top of footings or floor slabs.
  5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  6. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
  2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
- E. Waterstops: Install in construction joints and at other joints indicated according to manufacturer's written instructions.

### 3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete. Contractor shall contact the Government Inspector at least 24 hours prior to a pour to schedule all necessary inspections. Contractor shall not proceed with a concrete pour without the knowledge of the Inspector and/or Design Professional.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by the Inspector and/or Design Professional.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 and only under supervision of the on-site Inspector.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
  2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  2. Maintain reinforcement in position on chairs during concrete placement.
  3. Screed slab surfaces with a straightedge and strike off to correct elevations.
  4. Slope surfaces uniformly to drains where required.
  5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

### 3.8 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.

- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
  - 1. Apply to concrete surfaces exposed to public view.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

### 3.9 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
  - 1. Apply scratch finish to surfaces indicated.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
  - 1. Apply float finish to surfaces indicated.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
  - 1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, and ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces approved for “broom” finish by the Design Professional. While concrete is still plastic, slightly scarify surface with a fine broom.
  - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

### 3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

### 3.11 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-for spray.
    - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-in lap over adjacent absorptive covers
  - 2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
  - 3. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer, unless

manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

### 3.12 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
  - 1. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

### 3.13 CONCRETE SURFACE REPAIRS

- A. General Note: It will be at the Inspector's or Design Professional's discretion to request the repair of an area due to damage and/or flaws in materials or installation. A repair will only be granted to areas smaller than 100 sf. Areas in excess of 100 sf. will be evaluated by the Government and determined if necessary to completely remove and replace the defective area. At no time will the cost of repair and/or replacement be the burden of the Government.
- B. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- C. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- D. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
  - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
  - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
  - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- E. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, pop outs, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  2. After concrete has cured at least 14 days, correct high areas by grinding.
  3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
  4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
  5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
  6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
  7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- F. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

### 3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Contractor shall notify the Inspector and/or Design Professional at least 24 hours prior to a concrete pour. The Government Inspector will provide an inspection of the pour area and determine if all aspects are suitable for the pouring of concrete. The following is a lists of items that will be included in the Government's Pre-Pour Inspection:
  1. Steel Reinforcement Placement (Rebar and/or Welded Wire Fabric).
  2. Reinforcement Welds
  3. Headed Bolts
  4. Forms
  5. Stone Base (Thickness and Compaction)
  6. Pour area is clear of all foreign materials, water, mud, etc.
  7. Verification of Design Mix
  8. Approval of placement procedure.



C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
  - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
3. Testing Frequency: It shall be at the discretion and right of the On-Site Government Inspector to request testing at closer intervals based on visible inconsistencies in product and/or climate conditions.
4. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
5. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.

Compression Test Specimens: ASTM C 31/C 31M.

- a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
- b. Cast and field cure one set of two standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
  - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
  - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
10. Test results shall be reported in writing to the Inspector, Design Professional, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in

- Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by the Inspector but will not be used as sole basis for approval or rejection of concrete.
  12. Additional Tests: Testing agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by the Inspector.
  13. Additional testing at Contractor's expense will be performed to determine compliance of replaced or additional work with specified requirements.
  14. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.
- D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

END OF SECTION

## SECTION 055213 - PIPE AND TUBE RAILINGS

### PART 1 - GENERAL

#### 1.2 SUMMARY

##### A. Section Includes:

1. Steel pipe railings.

#### 1.3 COORDINATION

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

#### 1.4 ACTION SUBMITTALS

##### A. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected railings.
2. Railing brackets.
3. Grout, anchoring cement, and paint products.

##### B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

##### C. Samples: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Fittings and brackets.

3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
  - a. Show method of connecting and finishing members at intersections.
- D. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- E. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.
- F. Evaluation Reports: For post-installed anchors, from ICC-ES.

#### 1.6 QUALITY ASSURANCE

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

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

#### 1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Steel Pipe and Tube Railings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Wagner, R & B, Inc.
  - b. "Or Approved Equal"
- B. Source Limitations: Obtain each type of railing from single source from single manufacturer.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.
- B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  1. Handrails and Top Rails of Guards:
    - a. Uniform load of 50 lbf/ ft. applied in any direction.
    - b. Concentrated load of 200 lbf applied in any direction.
    - c. Uniform and concentrated loads need not be assumed to act concurrently.
  2. Infill of Guards:
    - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
    - b. Infill load and other loads need not be assumed to act concurrently.

## 2.3 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
  1. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

## 2.4 STEEL AND IRON

- A. Tubing: ASTM A 500 (cold formed) or ASTM A 513.
- B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
  1. Provide galvanized finish for exterior installations and where indicated.

- C. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- D. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- E. Expanded Metal: ASTM F 1267, Type I (expanded), Class 1 (uncoated).
- F. Woven-Wire Mesh: Intermediate-crimp, square pattern, 2-inch woven-wire mesh, made from 0.134-inch-diameter wire complying with ASTM A 510.

## 2.5 FASTENERS

- A. General: Provide the following:
  - 1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.
  - 2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
  - 3. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
  - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
  - 2. Provide Phillips or hex socket flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
  - 1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

## 2.6 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

- C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- E. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
  - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- F. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- G. Intermediate Coats and Topcoats: Provide products that comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- H. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.
- I. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- J. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- K. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

## 2.7 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

- G. Connections: Fabricate railings with either welded or nonwelded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove flux immediately.
  - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- J. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
  - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- K. Form Changes in Direction as Follows:
  - 1. By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.
- L. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- M. Close exposed ends of railing members with prefabricated end fittings.
- N. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- O. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
  - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- P. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- Q. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.



- R. For removable railing posts, fabricate slip-fit sockets from stainless-steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.
  - 1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.
- S. Expanded-Metal Infill Panels: Fabricate infill panels from expanded metal made from same metal as railings in which they are installed.
  - 1. Edge panels with U-shaped channels made from metal sheet, of same metal as expanded metal and not less than 0.043 inch thick.
  - 2. Orient expanded metal with long dimension of diamonds parallel to top rail.
- T. Perforated-Metal Infill Panels: Fabricate infill panels from perforated metal made from same metal as railings in which they are installed.
  - 1. Edge panels with U-shaped channels made from metal sheet, of same metal as perforated metal and not less than 0.043 inch thick.
  - 2. Orient perforated metal with pattern parallel to top rail.
- U. Woven-Wire Mesh Infill Panels: Fabricate infill panels from woven-wire mesh crimped into 1-by-1/2-by-1/8-inch metal channel frames. Make wire mesh and frames from same metal as railings in which they are installed.
  - 1. Orient wire mesh with wires perpendicular and parallel to top rail.
- V. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

## 2.8 STEEL AND IRON FINISHES

- A. Galvanized Railings:
  - 1. Hot-dip galvanized indicated steel railings, including hardware, after fabrication.
  - 2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
  - 3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
  - 4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
  - 5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

- D. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, galvanize anchors to be embedded in exterior concrete or masonry.
- E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below:
  - 1. Exterior Railings: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 2. Railings Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 3. Railings Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 4. Other Railings: SSPC-SP 3, "Power Tool Cleaning."
- F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
  - 1. Shop prime uncoated railings with universal shop primer unless indicated.
  - 2. Do not apply primer to galvanized surfaces.
- G. Shop-Painted Finish: Color: As selected by Government Design Professional from manufacturer's full range.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

#### 3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
  - 1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
  - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
  - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

### 3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

### 3.4 ANCHORING POSTS

- A. Cover anchorage joint with flange of same metal as post, attached to post with set screws.
- B. Leave anchorage joint exposed with anchoring material flush with adjacent surface.
- C. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
  1. For aluminum pipe railings, attach posts using fittings designed and engineered for this purpose.
  2. For stainless-steel pipe railings, weld flanges to post and bolt to supporting surfaces.
  3. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.
- D. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

### 3.5 ATTACHING RAILINGS

- A. Anchor railing ends at walls with round flanges anchored to wall construction and welded to railing ends or connected to railing ends using nonwelded connections.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends using nonwelded connections.
- C. Attach railings to wall with wall brackets, except where end flanges are used. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

- D. Secure wall brackets and railing end flanges to building construction as follows:
1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
  2. For hollow masonry anchorage, use toggle bolts.
  3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
  4. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.
  5. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

### 3.6 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "Interior Painting,"
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

### 3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

**END OF SECTION 055213**

## SECTION 079200 - JOINT SEALANTS

### PART 1 - GENERAL

#### 1.2 SUMMARY

- A. This Section includes joint sealants for the following applications:
1. Exterior joints in the following vertical surfaces and horizontal non-traffic surfaces:
    - a. Construction joints in cast-in-place concrete.
    - b. Control and expansion joints in unit masonry.
    - c. Joints between metal panels.
    - d. Joints between different materials listed above.
    - e. Perimeter joints between materials listed above and frames of doors and windows.
    - f. Other joints as indicated.
  2. Exterior joints in the following horizontal traffic surfaces:
    - a. Isolation and contraction joints in cast-in-place concrete slabs.
    - b. Tile control and expansion joints.
    - c. Other joints as indicated.
  3. Interior joints in the following vertical surfaces and horizontal non-traffic surfaces:
    - a. Control and expansion joints on exposed interior surfaces of exterior walls.
    - b. Perimeter joints of exterior openings where indicated.
    - c. Tile control and expansion joints.
    - d. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    - e. Other joints as indicated.
  4. Interior joints in the following horizontal traffic surfaces:
    - a. Isolation joints in cast-in-place concrete slabs.
    - b. Control and expansion joints in tile flooring.
    - c. Other joints as indicated.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

#### 1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Warranties: Special warranties specified in this Section.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

#### 1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
  - 2. When joint substrates are wet.
  - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  - 4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

#### 1.7 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two (2) years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Five (5) years from date of Substantial Completion.
- C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:

1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

## PART 2 - PRODUCTS

### 2.1 MATERIALS, GENERAL

- A. **Compatibility:** Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. **VOC Content of Interior Sealants:** Provide interior sealants and sealant primers that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
  1. Sealants: 250 g/L.
  2. Sealant Primers for Nonporous Substrates: 250 g/L.
  3. Sealant Primers for Porous Substrates: 775 g/L.
- C. **Colors of Exposed Joint Sealants:** As indicated by manufacturer's designations.

### 2.2 ELASTOMERIC JOINT SEALANTS

- A. **Elastomeric Sealants:** Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. **Stain-Test-Response Characteristics:** Where elastomeric sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. **Suitability for Contact with Food:** Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- D. **Multicomponent Pourable Neutral-Curing Silicone Sealant:**
  1. Type and Grade: M (multicomponent) and P (pourable).
  2. Class: 25.
  3. Uses Related to Exposure: T (traffic) and NT (non-traffic).
  4. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.
    - a. Use O Joint Substrates: Galvanized steel.

E. Single-Component Pourable Neutral-Curing Silicone Sealant:

1. Type and Grade: S (single component) and P (pourable).
2. Class: 100/50.
3. Uses Related to Exposure: NT and T (traffic).
4. Uses Related to Joint Substrates: M A and O, as applicable to joint substrates indicated.
  - a. Use O Joint Substrates: Galvanized steel.

F. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant:

1. Type and Grade: S (single component) and NS (non-sag).
2. Class: 25.
3. Use Related to Exposure: NT (non-traffic).
4. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
  - a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel and ceramic tile.

G. Multicomponent Pourable Urethane Sealant:

1. Type and Grade: M (multicomponent) and P (pourable).
2. Class: 25.
3. Use Related to Exposure: T (traffic).
4. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.
  - a. Use O Joint Substrates: Ceramic tile.

H. Multicomponent Pourable Urethane Sealant:

1. Type and Grade: M (multicomponent) and P (pourable).
2. Class: 25.
3. Uses Related to Exposure: T (traffic) and NT (non-traffic).
4. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
  - a. Use O Joint Substrates: Color anodic aluminum and aluminum coated with a high-performance coating.

2.3 SOLVENT-RELEASE JOINT SEALANTS

- A. Butyl-Rubber-Based Solvent-Release Joint Sealant: Comply with ASTM C 1085.
- B. Pigmented Narrow-Joint Sealant: Manufacturer's standard, solvent-release-curing, pigmented, synthetic-rubber sealant complying with AAMA 803.3 and formulated for sealing joints 3/16 inch or smaller in width.

2.4 PREFORMED JOINT SEALANTS



- A. Preformed Silicone-Sealant System: Manufacturer's standard system consisting of precured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.
- B. Preformed Foam Sealant: Manufacturer's standard preformed, pre-compressed, open-cell foam sealant that is manufactured from high-density urethane foam impregnated with a nondrying, water-repellent agent; is factory produced in pre-compressed sizes in roll or stick form to fit joint widths indicated; is coated on one side with a pressure-sensitive adhesive and covered with protective wrapping; develops a watertight and airtight seal when compressed to the degree specified by manufacturer; and complies with the following:
  - 1. Properties: Permanently elastic, mildew resistant, non-migratory, non-staining, and compatible with joint substrates and other joint sealants.
    - a. Density: Manufacturer's standard.

## 2.5 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

## 2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
    - b. Masonry.
    - c. Unglazed surfaces of ceramic tile.
  - 3. Remove laitance and form-release agents from concrete.
  - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    - a. Metal.
    - b. Glass.
    - c. Porcelain enamel.
    - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
  - 1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
  - 2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch. Hold edge of sealant bead 1/4 inch inside masking tape.
  - 3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
  - 4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.
- G. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.

### 3.4 CLEANING

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

### 3.5 PROTECTION

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

**END OF SECTION 079200**

## SECTION 081113 – HOLLOW METAL DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.2 SUMMARY

A. This Section includes the following:

1. Standard hollow-metal steel doors.
2. Standard hollow-metal steel frames.

B. Related Sections include the following:

1. Division 8 Sections for door hardware for standard steel doors.
2. Division 8 Sections for Blast Resistant Ratings
3. Division 9 Painting Sections for field painting standard steel doors and frames.

#### 1.3 DEPARTMENT OF DEFENSE REQUIREMENT

A. All exterior doors and windows, to include, but not limited to frames, glazing, anchoring, etc. **must** comply with the following regulation(s):

1. Unified Facilities Criteria (UFC) 4-010-01 and (UFC) 4-020-01: DoD Minimum Antiterrorism Standards for Buildings

#### 1.4 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

#### 1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance rating and finishes for each type of steel door and frame specified.

B. Shop Drawings: In addition to requirements below, provide a schedule of standard steel doors and frames using same reference numbers for details and openings as those on Drawings:

1. Elevations of each door design.

2. Details of doors, including vertical and horizontal edge details.
3. Frame details for each frame type, including dimensioned profiles.
4. Details and locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, accessories, joints, and connections.
7. Details of conduit and preparations for electrified door hardware and controls.

C. Qualification Data: For Installer.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- C. Source Limitations: Obtain standard steel doors and frames through one source from a single manufacturer.
- D. Fire-Rated Door Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.
  1. Test Pressure: Test at atmospheric (neutral) pressure according to NFPA 252 or UL 10B.
  2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with standard construction requirements for tested and labeled fire-protection-rated door assemblies except for size.
  3. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 450 deg F maximum in 30 minutes of fire exposure.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch-high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber.
  1. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

## 1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating standard steel frames without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

## 1.9 COORDINATION

- A. Coordinate installation of anchorages for standard steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in masonry. Deliver such items to Project site in time for installation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Ceco Door Products; an ASSA ABLOY Group Company.
  - 2. Fleming Door Products Ltd.; an ASSA ABLOY Group Company.
  - 3. Kewanee Corporation (The).
  - 4. Steelcraft; an Ingersoll-Rand Company.
  - 5. "Or Approved Equal"

### 2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 zinc-iron-alloy (galvannealed) coating designation.
- D. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, Commercial Steel (CS), Class B coating; mill phosphatized.
- E. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.
- F. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153/A 153M.

- G. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching standard steel door frames of type indicated.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-developed indexes of 25 and 50 respectively; passing ASTM E 136 for combustion characteristics.
- I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

### 2.3 STANDARD STEEL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces, unless otherwise indicated. Comply with ANSI A250.8.
  - 1. Design: Flush panel.
  - 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polyurethane, or vertical steel-stiffener core that produces doors complying with ANSI A250.8.
    - a. Fire Door Core: As required to provide fire-protection ratings indicated.
    - b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 6.0 deg F x h x sq. ft. /Btu when tested according to ASTM C 1363.
      - 1) Locations: Exterior doors.
  - 3. Vertical Edges for Single-Acting Doors: Beveled edge.
    - a. Beveled Edge: 1/8 inch in 2 inches.
  - 4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.
  - 5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch-thick end closures or channels of same material as face sheets.
  - 6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Hardware Reinforcement: Fabricate reinforcement plates from same material as door face sheets to comply with the following minimum sizes:
  - 1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
  - 2. Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
  - 3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch thick.
  - 4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.



- C. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

## 2.4 STANDARD STEEL FRAMES

- A. General: Comply with ANSI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
  - 1. Fabricate frames with mitered or coped and welded face corners and seamless face joints.
  - 2. Frames for Level 2 Steel Doors: 0.053-inch-thick steel sheet, unless otherwise indicated.
- C. Interior Frames: Fabricated from cold-rolled steel sheet, unless otherwise indicated to comply with exterior frame requirements.
  - 1. Fabricate frames with mitered or coped and welded face corners and seamless face joints, unless otherwise indicated.
  - 2. Fabricate knocked-down frames with mitered or coped corners, for field assembly.
  - 3. Fabricate knocked-down, drywall slip-on frames for in-place gypsum board partitions.
  - 4. Frames for Wood Doors: 0.053-inch-thick steel sheet.
- D. Hardware Reinforcement: Fabricate reinforcement plates from same material as frames to comply with the following minimum sizes:
  - 1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
  - 2. Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
  - 3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch thick.
  - 4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.
- E. Supports and Anchors: Fabricated from electrolytic zinc-coated or metallic-coated steel sheet.
- F. Jamb Anchors:
  - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
  - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
  - 3. Compression Type for Slip-on Frames: Adjustable compression anchors.
- G. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
  - 1. Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
- H. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

## 2.5 STOPS AND MOLDINGS

- A. Fixed Frame Moldings: Formed integral with standard steel frames, minimum 5/8 inch high, unless otherwise indicated.
- B. Astragals: Provide Astragals and/or Astragal Weather Strips at all exterior double doors.

## 2.6 FABRICATION

- A. General: Fabricate standard steel doors and frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Standard Steel Doors:
  - 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
- C. Standard Steel Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
  - 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
  - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners, unless otherwise indicated.
  - 3. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
  - 4. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      - 1) Two anchors per jamb up to 60 inches in height.
      - 2) Three anchors per jamb from 60 to 90 inches in height.
      - 3) Four anchors per jamb from 90 to 120 inches in height.
      - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof more than 120 inches in height.
    - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      - 1) Three anchors per jamb up to 60 inches in height.
      - 2) Four anchors per jamb from 60 to 90 inches in height.
      - 3) Five anchors per jamb from 90 to 96 inches in height.
      - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof more than 96 inches in height.

- 5) Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
  - c. Compression Type: Not less than two anchors in each jamb.
- 5. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.
  - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
  - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Hardware Preparation: Factory prepare standard steel doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."
  - 1. Reinforce doors and frames to receive non-templated mortised and surface-mounted door hardware.
  - 2. Comply with applicable requirements in ANSI A250.6 and ANSI/DHI A115 Series specifications for door and frame preparation for hardware. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.
- E. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
  - 1. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
  - 2. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

## 2.7 STEEL FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  - 1. Finish standard steel door and frames after assembly.
- B. Metallic-Coated Steel Surface Preparation: Clean surfaces with non-petroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
  - 1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- C. Steel Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel; comply with SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

- D. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.
  - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of standard steel doors and frames.
  - 1. Examine roughing-in for embedded and built-in anchors to verify actual locations of standard steel frame connections before frame installation.
  - 2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
  - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory.
- B. Prior to installation and with installation spreaders in place, adjust and securely brace standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
  - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
  - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
  - 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  - 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive non-templated mortised and surface-mounted door hardware.

#### 3.3 INSTALLATION

- A. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install standard steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

- B. Standard Steel Frames: Install standard steel frames for doors and other openings, of size and profile indicated. Comply with SDI 105.
1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
    - a. At fire-protection-rated openings, install frames according to NFPA 80.
    - b. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    - c. Install door silencers in frames before grouting.
    - d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    - e. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    - f. Apply bituminous coating to backs of frames that are filled with mortar, grout, and plaster containing antifreeze agents.
  2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with post installed expansion anchors.
    - a. Floor anchors may be set with powder-actuated fasteners instead of post installed expansion anchors if so indicated and approved on Shop Drawings.
  3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
  4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar as specified in Division 4 Section "Unit Masonry Assemblies."
  5. In-Place Gypsum Board Partitions: Secure frames in place with post installed expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
  6. Installation Tolerances: Adjust standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
    - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Standard Steel Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Standard Steel Doors:
    - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
    - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
    - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.

- d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

### 3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including standard steel doors or frames that are warped, bowed, or otherwise unacceptable.
- B. Clean grout and other bonding material off standard steel doors and frames immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
- D. Galvannealed Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

**END OF SECTION 081113**

## SECTION 087111 - DOOR HARDWARE

### PART 1 - GENERAL

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Commercial door hardware for the following:
    - a. Swinging doors.
    - b. Other doors to the extent indicated.
  - 2. Cylinders for doors specified in other Sections.
- B. Related Sections include the following:
  - 1. Division 8 Section "Hollow Metal Doors and Frames".

#### 1.3 SUBMITTALS

- A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of door hardware indicated.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
  - 1. Include lists of completed projects with project names and addresses of architects and owners, and other information specified.
- D. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1.
- E. Warranties: Special warranties specified in this Section.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
  - 1. Scheduling Responsibility: Preparation of door hardware and keying schedules.
- C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
- D. Regulatory Requirements: Comply with provisions of the following:
  - 1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," as follows:
    - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
    - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
      - 1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
      - 2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
    - c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.
  - 2. NFPA 101: Comply with the following for means of egress doors:
    - a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
    - b. Door Closers: Not more than 30 lbf to set door in motion and not more than 15 lbfto open door to minimum required width.
    - c. Thresholds: Not more than 1/2 inch high.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.



- C. Keys to be handed over to the Government Representative at final Construction Progress Meeting.

## 1.6 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
  - 1. Structural failures including excessive deflection, cracking, or breakage.
  - 2. Faulty operation of operators and door hardware.
  - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- C. Warranty Period: Three (3) years from date of Substantial Completion, unless otherwise indicated.
- D. Warranty Period for Manual Closers: Ten (10) years from date of Substantial Completion.

## 1.7 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

## PART 2 - PRODUCTS

### 2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section, the Door Hardware Schedule located on sheet A.4.1
  - 1. Door Hardware Sets: Requirements for quantity, item, design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Schedule at the end of Part 3. Products are identified by descriptive titles corresponding to requirements specified in Part 2.

### 2.2 HINGES AND PIVOTS, GENERAL

- 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. Hinges:

- a. Stanley Commercial Hardware; Div. of The Stanley Works.
- 2. Continuous Geared Hinges:
  - a. McKinney Products Company; Div. of ESSEX Industries, Inc.
- B. Standards: Comply with the following:
  - 1. Butts and Hinges: BHMA A156.1.
  - 2. Template Hinge Dimensions: BHMA A156.7.
- C. Quantity: Provide the following, unless otherwise indicated:
  - 1. Two Hinges: For doors with heights up to 60 inches.
  - 2. Three Hinges: For doors with heights 61 to 90 inches.
  - 3. Four Hinges: For doors with heights 91 to 120 inches.
  - 4. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
- D. Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

Maximum Door Size (inches)	Hinge Height (inches)	Metal Thickness (inches)	
		Standard Weight	Heavy Weight
34 by 84 by 1-3/8	3-1/2	0.123	-
36 by 84 by 1-3/8	4	0.130	-
36 by 84 by 1-3/4	4-1/2	0.134	0.180

- E. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- F. Hinge Applications: Unless otherwise indicated, provide the following:
  - 1. Entrance Doors: Heavy-weight hinges.
  - 2. Doors with Closers: Antifriction-bearing hinges.
  - 3. Interior Doors: Standard-weight hinges.
- G. Hinge Base Metal: Unless otherwise indicated, provide the following:
  - 1. Exterior Hinges: Stainless steel, with stainless-steel pin.
  - 2. Interior Hinges: Stainless steel, with stainless-steel pin.
  - 3. Hinges for Fire-Rated Assemblies: Stainless steel, with stainless-steel pin.

H. Hinge Options: Comply with the following:

1. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:
  - a. Outswinging exterior doors.
  - b. Outswinging corridor doors with locks.
2. Corners: Square.
3. Reverse Safety Stud: Metal stud extension on back of each leaf that engages hole in reinforcing plate.
4. Safety Stud: Metal stud extension on exposed side of one leaf that engages hole in opposite leaf when door is closed.

I. Fasteners: Comply with the following:

1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
2. Screws: Phillips flat-head screws; machine screws (drilled and tapped holes) for metal doors. Finish screw heads to match surface of hinges.

## 2.3 HINGES

A. Antifriction-Bearing, Full-Mortise (Butt) Hinges: Standard weight; BHMA Grade 2, with 2 ball bearings; button tips; non-rising removable pins; and base metal as follows:

1. Base Metal: Stainless steel.

B. Plain-Bearing, Standard-Weight, Full-Mortise (Butt) Hinges: BHMA Grade 3, button tips, non-rising removable pins, and base metal as follows:

1. Base Metal: Stainless steel.

## 2.4 LOCKS AND LATCHES, GENERAL

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. Mechanical Locks and Latches:
  - a. Best Access Systems: DMVA/PAARNG request that only Best Lock Cores be utilized for this project

B. Standards: Comply with the following:

1. Bored Locks and Latches: BHMA A156.2.
2. Mortise Locks and Latches: BHMA A156.13.
3. Interconnected Locks and Latches: BHMA A156.12.
4. Auxiliary Locks: BHMA A156.5.
5. Push-Button Combination Locks: BHMA A156.2.

- C. Bored Locks: BHMA Grade 2; Series 4000.
- D. Mortise Locks: Stamped steel case with steel or brass parts; BHMA Grade 2; Series 1000.
- E. Interconnected Locks: BHMA Grade 1, unless Grade 2 is indicated; Series 5000.
- F. Auxiliary Locks: BHMA Grade 1, unless Grade 2 is indicated.
- G. Certified Products: Provide door hardware listed in the following BHMA directories:
  - 1. Mechanical Locks and Latches: BHMA's "Directory of Certified Locks & Latches."
- H. Lock Trim: Comply with the following:
  - 1. Lever: Wrought, forged, or cast.
  - 2. Knob: Wrought, forged, or cast.
  - 3. Escutcheon (Rose): Wrought, forged, or cast.
  - 4. Dummy Trim: Match lever lock trim and escutcheons.
  - 5. Lockset Designs: Provide lockset design designated below or, if sets are provided by another manufacturer, provide designs that match those designated:
    - a. Bored Locks: Best Access Systems – Post Standard, no substitutions allowed
- I. Lock Functions: Function numbers and descriptions indicated in the Door Hardware Schedule comply with the following:
  - 1. Bored Locks: BHMA A156.2.
  - 2. Mortise Locks: BHMA A156.13.
  - 3. Interconnected Locks: BHMA A156.12.
- J. Lock Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
  - 1. Bored Locks: Minimum 1/2-inch latch bolt throw.
  - 2. Mortise Locks: Minimum 3/4-inch latch bolt throw.
  - 3. Deadbolts: Minimum 1-inch bolt throw.
- K. Rabbeted Doors: Provide special rabbeted front and strike on locksets for rabbeted meeting stiles.
- L. Backset: 2-3/4 inches, unless otherwise indicated.

## 2.5 MECHANICAL LOCKS AND LATCHES

- A. Bored Auxiliary Locks: Comply with the following:
  - 1. Material: Stainless steel.
  - 2. Deadlocks: Deadbolt operated by key either side.

## 2.6 HIGH SECURITY LOCKS AND LATCHES

- 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. High Security Locks and Latches:
    - a. KABA MAS Security and Control: **CDX-10**
    - b. “Or Approved Equal”
  
- B. Operation: Lock opens by entering a digital numeric code via twist dial. Comply with the following:
  - 1. Power: Internal, self-powered.
  - 2. Combinations: 3 modes:  
Single: 1 million combinations  
Dual: 500 billion combinations  
Supervisor/Subordinate: 2 million combinations
  - 3. Direct Dial: No need to clear before entering combination. Once you stop turning the dial, the power will shut down after 40 seconds.
  - 4. Dead Zones: None
  - 5. Memory: Non-volatile
  - 6. LCD: Limited View Liquid Crystal Display with indicator arrows.
  - 7. Combination Changes: (LCD indicator in change key mode). Combination changed with correct combination or serial number.
  - 8. Random Number View: True Scramble
  - 9. Daylocking: No
  - 10. Back Dialing: No
  - 11. Lock Reset: Automatic when bolt is thrown or 40 seconds after turning has stopped.
  - 12. Manipulation: Fail secure against high-voltage attack, robot attack, X-ray methods, magnetic, vibration, and R/F.
  - 13. Wrong Try Penalty: 10-14 errors results in a 3 minute time out. 15 errors or greater results in a 4 minute time out. Both error count and penalty time resets with valid combination.
  - 14. Back Cover: Lock On Back Cover pin prevents removing the back cover without the combination.
  - 15. Exit/Panic Hardware: Lock shall be interconnected with exit device releasing deadbolt and latch bolt when touch bar is depressed.

## 2.7 DOOR BOLTS, GENERAL

- 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. Flush Bolts: Best Access Systems – Post Standard, no substitutions allowed
  
- B. Standards: Comply with the following:
  - 1. Automatic and Self-Latching Flush Bolts: BHMA A156.3.
  - 2. Manual Flush Bolts: BHMA A156.16.

- C. Flush Bolts: BHMA Grade 2, designed for mortising into door edge.
- D. Bolt Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
  - 1. Mortise Flush Bolts: Minimum 3/4-inch throw.

## 2.8 DOOR BOLTS

- A. Automatic Flush Bolts: Fabricated from steel and brass components, with spring-activated bolts that automatically retract when active leaf is opened and that automatically engage when active door depresses bolt trigger. Provide brass or stainless-steel cover plate, top and bottom strikes, guides, guide supports, wear plates, and shims.
- B. Self-Latching Flush Bolts: Fabricated from steel and brass components, with spring-activated bolts that automatically engage when active door depresses trigger. Bolts are manually retracted by a slide in the bolt face. Provide brass or stainless-steel cover plate, top and bottom strikes, guides, guide supports, wear plates, and shims.

## 2.9 EXIT DEVICES, GENERAL

- 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. Corbin Russwin Architectural Hardware; Div. of Yale Security Inc.
- B. Standard: BHMA A156.3.
  - 1. BHMA Grade: Grade 1, unless Grade 2 is indicated.
- C. Certified Products: Provide exit devices listed in BHMA's "Directory of Certified Exit Devices."
- D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- E. Outside Trim: Knob with cylinder; material and finish to match locksets, unless otherwise indicated.
  - 1. Match design for locksets and latch sets, unless otherwise indicated.
- F. Through Bolts: For exit devices and trim on metal doors.

## 2.10 EXIT DEVICES

- A. Mortise Exit Devices: Comply with the following:
  - 1. Type: Type 3.
  - 2. Actuating Bar: Push pad.

3. Material: Stainless steel.

## 2.11 CYLINDERS AND KEYING

- 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. Cylinders: Same manufacturer as for locks and latches.
- B. Standards: Comply with the following:
  1. Cylinders: BHMA A156.5.
- C. Cylinder Grade: BHMA Grade 2.
- D. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:
  1. Number of Pins: Six.
  2. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
  3. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
  4. Bored-Lock Type: Cylinders with tailpieces to suit locks.
    - a. High-Security Grade: BHMA Grade 1A, listed and labeled as complying with pick- and drill-resistant testing requirements of UL 437 (Suffix A).
- E. Permanent Cores:
  1. Best Access Systems: **DMVA STANDARD, NO SUBSTITUTIONS**
  2. Standard Core: **WA Premium Heavy Key (PT# ICP7WA-626)**
- F. Construction Keying: Comply with the following:
  1. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal.
  2. Construction Cores: Provide construction cores that are replaceable by permanent cores.
    - a. Turn cores over to Government once all construction is completed.
- G. Permanent Keying: Unless otherwise indicated, Government will be responsible for all permanent keying.

## 2.12 STRIKES

- A. Standards: Comply with the following:
  1. Strikes for Bored Locks and Latches: BHMA A156.2.
  2. Strikes for Mortise Locks and Latches: BHMA A156.13.
  3. Strikes for Interconnected Locks and Latches: BHMA A156.12.

4. Strikes for Auxiliary Deadlocks: BHMA A156.5.

B. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latch bolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.

#### 2.13 OPERATING TRIM, GENERAL

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. Stanley Commercial Hardware; Div. of The Stanley Works.

B. Standard: Comply with BHMA A156.6.

C. Materials: Fabricate from stainless steel, unless otherwise indicated.

#### 2.14 OPERATING TRIM

A. Flat Push Plates: 0.050 inch thick, 4 inches wide by 16 inches high; with square corners and beveled edges, secured with exposed screws.

B. Single Push Bar: Horizontal bar, with minimum clearance of 1-1/2 inches from face of door, and as follows:

1. Shape and Size: Minimum 3/8-by-1-1/4-inch flat bar.
2. Mounting: Surface applied with concealed fasteners.

#### 2.15 ACCESSORIES FOR PAIRS OF DOORS

A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release.

B. Carry-Open Bars: BHMA A156.3; prevent the inactive leaf from opening before the active leaf; provide polished brass or bronze carry-open bars with strike plate for inactive leaves of pairs of doors unless automatic or self-latching bolts are used.

C. Flat Overlapping Astragals: BHMA A156.22; flat stainless steel metal bar, surface mounted on face of door with screws; minimum 1/8 inch thick by 2 inches wide by full height of door.

D. CLOSERS, GENERAL



- E. 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. Surface-Mounted Closers:
- F. Standards: Comply with the following:
  - 1. Closers: BHMA A156.4.
- G. Surface Closers: BHMA Grade 2.
- H. Certified Products: Provide door closers listed in BHMA's "Directory of Certified Door Closers."
- I. Power-Assist Closers: As specified in Division 8 Section "Power Door Operators" for access doors for the disabled or where listed in the Door Hardware Schedule. Provide electrohydraulic, electromechanical, and pneumatic types as indicated.
- J. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

## 2.16 CLOSERS

- A. Modern-Type-with-Cover Surface Closers: Rack-and-pinion hydraulic type; with adjustable sweep and latch speeds controlled by key-operated valves; with forged-steel main arm; enclosed in cover indicated; complying with the following:
  - 1. Mounting: Hinge side.
  - 2. Type: Delayed action closing.
  - 3. Backcheck: Adjustable, effective between 60 and 85 degrees of door opening.
  - 4. Cover Material: Aluminum.
  - 5. Closing Power Adjustment: At least 35 percent more than minimum tested value.

## 2.17 PROTECTIVE TRIM UNITS, GENERAL

- 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. Metal Protective Trim Units:
    - a. Baldwin Hardware Corporation.
- B. Standard: Comply with BHMA A156.6.
- C. Materials: Fabricate protection plates from the following:
  - 1. Stainless Steel: 0.050 inch thick; beveled top and 2 sides.

- D. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units consisting of either machine or self-tapping screws.
- E. Furnish protection plates sized 1-1/2 inches less than door width on push side and 1/2 inch less than door width on pull side, by height specified in schedule.

#### 2.18 PROTECTIVE TRIM UNITS

- A. Kick Plates: 12 inches high by door width, with allowance for frame stops.

#### 2.19 STOPS AND HOLDERS

- A. Stops and Bumpers: BHMA A156.16, Grade 1 unless Grade 2 is indicated.
  - 1. Provide floor stops for doors unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.
- B. Combination Floor and Wall Stops and Holders: BHMA A156.8, Grade 1 unless Grade 2 is indicated.
- C. Wall Bumpers: Polished cast brass or aluminum with rubber bumper; 2-1/2-inch diameter, minimum 3/4-inch projection from wall, with back plate for concealed fastener installation; with concave bumper configuration.

#### 2.20 DOOR GASKETING, GENERAL

- 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. Door Gasketing:
    - a. Reese Enterprises, Inc.
- B. Standard: Comply with BHMA A156.22.
- C. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide non-corrosive fasteners for exterior applications and elsewhere as indicated.
  - 1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- D. Air Leakage: Not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Gasketing Materials: Comply with ASTM D 2000 and AAMA 701/702.

## 2.21 DOOR GASKETING

- A. Adhesive-Backed Perimeter Gasketing: Gasket material applied to frame rabbet with self-adhesive.
  - 1. Gasket Material: Sponge neoprene.
- B. Exterior Door Sweeps: Neoprene gasket material held in place by flat aluminum housing or flange; surface mounted to face of door with screws.

## 2.22 THRESHOLDS, GENERAL

- 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. Reese Enterprises, Inc.
- B. Standard: Comply with BHMA A156.21.

## 2.23 THRESHOLDS

- A. Plate Thresholds: Solid metal plate; and base metal as follows:
  - 1. Top Surface: Fluted with slip-resistant abrasive.
  - 2. Base Metal: Stainless steel.

## 2.24 FABRICATION

- A. Manufacturer's Nameplate: Do not provide manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise approved by Architect.
  - 1. Manufacturer's identification will be permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18 for finishes. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.
- C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
  - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means

of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

2. Steel Machine or Wood Screws: For the following fire-rated applications:
  - a. Mortise hinges to doors.
  - b. Strike plates to frames.
  - c. Closers to doors and frames.
3. Steel Through Bolts: For the following fire-rated applications, unless door blocking is provided:
  - a. Closers to doors and frames.
4. Spacers or Sex Bolts: For through bolting of hollow metal doors.
5. Fasteners for Wood Doors: Comply with requirements of DHI WDHS.2, "Recommended Fasteners for Wood Doors."

## 2.25 FINISHES

- A. Standard: Comply with BHMA A156.18.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. BHMA Designations: Comply with base material and finish requirements indicated by the following:
  1. BHMA 600: Primed for painting, over steel base metal.
  2. BHMA 605: Bright brass, clear coated, over brass base metal.
  3. BHMA 606: Satin brass, clear coated, over brass base metal.
  4. BHMA 609: Satin brass, blackened, satin relieved, clear coated, over brass base metal.
  5. BHMA 611: Bright bronze, clear coated, over bronze base metal.
  6. BHMA 612: Satin bronze, clear coated, over bronze base metal.
  7. BHMA 613: Dark-oxidized satin bronze, oil rubbed, over bronze base metal.
  8. BHMA 618: Bright nickel plated, clear coated, over brass or bronze base metal.
  9. BHMA 619: Satin nickel plated, clear coated, over brass or bronze base metal.
  10. BHMA 622: Flat black coated, over brass or bronze base metal.
  11. BHMA 623: Light-oxidized statuary bronze, clear coated, over bronze base metal.
  12. BHMA 624: Dark-oxidized statuary bronze, clear coated, over bronze base metal.
  13. BHMA 625: Bright chromium plated over nickel, over brass or bronze base metal.
  14. BHMA 626: Satin chromium plated over nickel, over brass or bronze base metal.
  15. BHMA 627: Satin aluminum, clear coated, over aluminum base metal.
  16. BHMA 628: Satin aluminum, clear anodized, over aluminum base metal.
  17. BHMA 629: Bright stainless steel, over stainless-steel base metal.

18. BHMA 630: Satin stainless steel, over stainless-steel base metal.
19. BHMA 651: Bright chromium plated over nickel, over steel base metal.
20. BHMA 652: Satin chromium plated over nickel, over steel base metal.
21. BHMA 689: Aluminum painted, over any base metal.
22. BHMA 690: Dark bronze painted, over any base metal.
23. BHMA 691: Light bronze painted, over any base metal.
24. BHMA 717: Bright aluminum, uncoated; aluminum base metal.
25. BHMA 718: Satin aluminum, uncoated; aluminum base metal.
26. BHMA 722: Dark-oxidized bronze, oil rubbed, over architectural bronze base metal.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Wood Doors: Comply with DHI A115-W series.

### 3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
  1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
  2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

### 3.4 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

### 3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
  1. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.
- B. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:
  1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
  2. Consult with and instruct Owner's personnel on recommended maintenance procedures.
  3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

### 3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

### 3.7 DEMONSTRATION

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

**END OF SECTION 087111**

## SECTION 092216 - NON-STRUCTURAL METAL FRAMING

### PART 1 - GENERAL

#### 1.2 SUMMARY

- A. This Section includes non-load-bearing steel framing members for the following applications:
  - 1. Interior framing systems.

#### 1.3 SUBMITTALS

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

#### 1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, 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.

### PART 2 - PRODUCTS

#### 2.1 NON-STRUCTURAL METAL FRAMING, GENERAL

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
  - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
  - 2. Protective Coating: manufacturer's standard corrosion-resistant zinc coating, unless otherwise indicated.

## 2.2 STEEL FRAMING FOR FRAMED ASSEMBLIES

- A. Steel Studs and Runners: ASTM C 645.
  - 1. Minimum Base-Metal Thickness: 0.0179 inch.
- B. Slip-Type Head Joints: Where indicated, provide one of the following:
  - 1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch-deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
  - 2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
  - 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- C. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
  - 1. Minimum Base-Metal Thickness: 0.0179 inch.
- D. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel thickness, with minimum 1/2-inch-wide flanges.
  - 1. Depth: As indicated on Drawings.
  - 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.
- E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
  - 1. Minimum Base Metal Thickness: 0.0179 inch.
  - 2. Depth: As indicated on Drawings.
- F. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission.
  - 1. Configuration: Asymmetrical or hat shaped.
- G. Cold-Rolled Furring Channels: 0.0538-inch bare-steel thickness, with minimum 1/2-inch-wide flanges.
  - 1. Depth: As indicated on Drawings.
  - 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare-steel thickness of 0.0312 inch.
  - 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch-diameter wire.
- H. Z-Shaped Furring: With slotted or non-slotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum bare-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.



## 2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
  - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
  - 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
  - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
  - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

### 3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
  - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

### 3.4 INSTALLING FRAMED ASSEMBLIES

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install studs so flanges within framing system point in same direction.
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
  - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
  - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
    - a. Install two studs at each jamb, unless otherwise indicated.
    - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
  - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
  - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
    - a. Fire-stop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
  - 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- D. Direct Furring:
  - 1. Screw to wood framing.
  - 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- E. Z-Furring Members:
  - 1. Erect insulation (specified in Division 7 Section "Building Insulation") vertically and hold in place with Z-furring members spaced 24 inches o.c.
  - 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

**END OF SECTION 092216**

## SECTION 092900 - GYPSUM BOARD

### 1.2 SUMMARY

A. This Section includes the following:

1. Interior gypsum board.

### 1.3 SUBMITTALS

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

### 1.4 STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

### 1.5 PROJECT CONDITIONS

A. The following conditions **MUST BE** met prior to the installation of gypsum board.

B. 1. Hanging Gypsum Board: Building envelope shall be permanently sealed so that to prevent the infiltration of outside elements (wind, rain, etc.) and a minimum temperature of 40° F shall be established and maintained throughout installation.

C. 2. Finishing Gypsum Board: Areas to be finished shall maintain a minimum temperature of 50° F for at least 24 hours prior to the start of the finishing process and be held during and after completion of work.

D. 3. Contractor shall contact the On-Site Government Inspector at least 48 hours prior to the start of any gypsum board work. Work will not be permitted until space conditions, as detailed above, are verified by the Government Inspector.

- E. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- F. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

## PART 2 - PRODUCTS

### 2.1 PANELS, GENERAL

- A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

### 2.2 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
  - 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. American Gypsum Co.
    - b. G-P Gypsum.
    - c. USG Corporation.
    - d. Or Approved Equal
- B. Gypsum Board: ASTM C 1396/C 1396M.
  - 1. Thickness: 5/8 inch
  - 2. Long Edges: Tapered.
- C. Moisture and Mold Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
  - 1. Core: 5/8 inch, Type X.
  - 2. Long Edges: Tapered.
  - 3. Mold Resistance: ASTM D 3273, score of 10.

### 2.3 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. Expansion (control) joint.

#### 2.4 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
  1. Interior Gypsum Wallboard: Paper.
- C. Joint Compound for Interior Gypsum Wallboard: 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-type taping compound.
    - a. Use setting-type compound for installing paper-faced metal trim accessories.
  3. Fill Coat: For second coat, use setting-type, sandable topping compound.
  4. Finish Coat: For third coat, use setting-type, sandable topping compound.

#### 2.5 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
  1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.
  - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch-wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members, or provide control joints to counteract wood shrinkage.
- J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

### 3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  - 1. Regular Type: As indicated on Drawing A.3.2.
  - 2. Moisture- and Mold-Resistant Type: As indicated on Drawing A.3.2.
- B. Single-Layer Application:
  - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
  - 2. On partitions/walls, apply gypsum panels 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.
  - 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
  - 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

### 3.4 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Interior Trim: Install in the following locations:
  - 1. Cornerbead: Use at outside corners, unless otherwise indicated.
  - 2. Bullnose Bead: Use at outside corners.

### 3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Pre-fill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  - 1. Level 3: Throughout.



- a. Primer and its application to surfaces are specified in other Division 9 Sections.

### 3.6 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

**END OF SECTION 092900**

## SECTION 095123 - ACOUSTICAL TILE CEILINGS

### PART 1 - GENERAL

#### 1.2 SUMMARY

- A. This Section includes acoustical tiles for ceilings and the following:
  - 1. Concealed suspension systems.
  - 2. Acoustical Ceiling Tiles
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

#### 1.3 DEFINITIONS

- A. AC: Articulation Class.
- B. CAC: Ceiling Attenuation Class.
- C. LR: Light-Reflectance coefficient.
- D. NRC: Noise Reduction Coefficient.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, to include manufacturer's full range of color and texture selections.
- B. Qualification Data: For testing agency.
- C. Maintenance Data: For finishes to include in maintenance manuals.

#### 1.5 QUALITY ASSURANCE

- A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.

- B. Source Limitations:
  - 1. Acoustical Ceiling Tile: Obtain each type through one source from a single manufacturer.
  - 2. Suspension System: Obtain each type through one source from a single manufacturer.
- C. Source Limitations: Obtain each type of acoustical ceiling tile and supporting suspension system through one source from a single manufacturer.
- D. Fire-Test-Response Characteristics: Provide acoustical tile ceilings that comply with the following requirements:
  - 1. Fire-Resistance Characteristics: Where indicated, provide acoustical tile ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
    - a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
    - b. Identify materials with appropriate markings of applicable testing and inspecting agency.
  - 2. Surface-Burning Characteristics: Provide acoustical tiles with the following surface-burning characteristics complying with ASTM E 1264 for Class B materials as determined by testing identical products per ASTM E 84:
    - a. Smoke-Developed Index: 450 or less.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical tiles, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

## 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
  - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical tile ceiling installation.

## 1.8 COORDINATION

- A. Coordinate layout and installation of acoustical tiles 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.

## 1.9 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. Acoustical Ceiling Units: Full-size tiles equal to 2.0 percent of quantity installed.
  - 2. Suspension System Components: Quantity of each concealed grid and exposed component equal to 2.0 percent of quantity installed.

## PART 2 - PRODUCTS

### 2.1 ACOUSTICAL TILES, GENERAL

- A. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance, unless otherwise indicated.
  - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.
- B. Acoustical Tile Colors and Patterns: Match appearance characteristics indicated for each product type.
  - 1. Where appearance characteristics of acoustical tiles are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

### 2.2 ACOUSTICAL TILES FOR ACOUSTICAL TILE CEILING

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Armstrong World Industries, Inc. 241 SuperTuff BioBlock
  - 2. USG Interiors, Inc.
  - 3. "Or Approved Equal"
- B. Color: White.
- C. LR: Not less than 0.80.

- D. NRC: Not less than 0.55.
- E. CAC: Not less than 30.
- F. AC: Not less than 170.
- G. Edge/Joint Detail: Based upon selected manufacturer's standard.
- H. Dimensions: 24" x 24" x 5/8"
- I. Must be **Mold, Mildew and Bacteria Resistant**

### 2.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
- B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
  - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
  - 2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.
- E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch-diameter bolts.

### 2.4 METAL SUSPENSION SYSTEM FOR ACOUSTICAL TILE CEILING

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Armstrong World Industries, Inc.; Prelude ML 15/16" Exposed Grid System.
  - 2. USG Interiors, Inc.
  - 3. "Or Approved Equal"
- B. Direct-Hung, Double-Web Suspension System: Main and cross runners roll formed from and capped with cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, G30 coating designation.

1. Structural Classification: Intermediate-duty system.
2. Access: Upward and end or side pivoted, with initial access openings of size indicated below and located throughout ceiling within each module formed by main and cross runners, with additional access available by progressively removing remaining acoustical tiles.

## 2.5 METAL EDGE MOLDINGS AND TRIM

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  1. Armstrong World Industries, Inc.; Prelude ML 15/16” Exposed Grid System.
  2. USG Interiors, Inc.
  3. “Or Approved Equal”
- B. Hot-dipped Galvanized Steel, Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
  1. Provide manufacturer's standard edge moldings that fit acoustical tile edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.
  2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
  3. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; organic coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical tile ceilings.
  1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders, and comply with layout shown on reflected ceiling plans.

### 3.3 INSTALLATION, SUSPENDED ACOUSTICAL TILE CEILINGS

- A. General: Install acoustical tile ceilings to comply with UBC Standard 25-2 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.
- B. Suspend ceiling hangers from building's structural members and as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
  2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter splaying, or other equally effective means.
  3. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, counter splaying, or other equally effective means.
  4. Where width of ducts and other construction within ceiling plenum produces hanger spacing that interfere with location of hangers at spacing required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
  5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  6. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
  7. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post-installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
  8. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
  9. Do not attach hangers to steel deck tabs.
  10. Do not attach hangers to steel roof deck. Attach hangers to structural members.
  11. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
  12. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post installed anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical tiles.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
  2. Screw attach moldings to substrate at intervals not more than 16 inches oc. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
  3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Arrange directionally patterned acoustical tiles as follows:
1. Install tiles with pattern running in one direction parallel to short axis of space.
- G. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension system flanges into kerfed edges so tile-to-tile joints are closed by double lap of material.
1. Fit adjoining tile to form flush, tight joints. Scribe and cut tile for accurate fit at borders and around penetrations through tile.
  2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tile and moldings, spaced 12 inches o.c.
  3. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

#### 3.4 CLEANING

- A. Clean exposed surfaces of acoustical tile ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

**END OF SECTION 095123**



SECTION 096519

RESILIENT TILE FLOORING

PART 1 - GENERAL

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Vinyl composition tile (VCT).
  - 2. Resilient wall base.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Maintenance Data: For resilient products to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store tiles on flat surfaces.

1.6 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
  - 1. 48 hours before installation.

2. During installation.
  3. 48 hours after installation.
- B. After post-installation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 48 hours after floor covering installation.
- E. Install resilient products after other finishing operations, including painting, have been completed.

## 1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Floor Tile: Furnish 1 box for every 25 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
  2. Resilient Wall Base: Furnish not less than 10 linear feet for every 200 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

## 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, the products listed in other Part 2 articles.

### 2.2 COLORS AND PATTERNS

- A. Colors and Patterns: As selected by Government Design Professional from manufacturer's full range.

### 2.3 VINYL COMPOSITION TILE

- A. Vinyl Composition Tile (VCT): ASTM F 1066.
1. Armstrong World Industries, Inc.
  2. Congoleum Corporation.
  3. Or "Approved Equal."
- B. Class: 1 (solid-color tile) or 3 (surface-pattern tile).
- C. Wearing Surface: Smooth.

- D. Thickness: 0.125 inch.
- E. Size: 12 by 12 inches.
- F. Fire-Test-Response Characteristics:
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E 648.

## 2.4 RESILIENT WALL BASE

- A. Wall Base: ASTM F 1861.
  - 1. Armstrong World Industries, Inc.
  - 2. Johnsonite.
  - 3. Or "Approved Equal."
- B. Type: TV (vinyl).
- C. Group: I (solid, homogeneous)
- D. Style: Butt-to cove with extended square-edge toe that fits flush to floor covering.
- E. Minimum Thickness: 0.080 inch.
- F. Height: 4 inches.
- G. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length.
- H. Outside Corners: Pre-molded.
- I. Inside Corners: Pre-molded.
- J. Surface: Smooth.

## 2.5 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
  - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    - a. VCT and Asphalt Tile Adhesives: 50 g/L.
    - b. Cove Base Adhesives: 50 g/L.
    - c. Rubber Floor Adhesives: 60 g/L.

- C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
  - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
  - 3. Moisture Testing:
    - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    - b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- D. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.
- E. Use trowelable leveling and patching compound to fill cracks, holes, and depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions
- F. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
  - 1. Do not install resilient products until they are same temperature as space where they are to be installed.

- G. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.3 TILE INSTALLATION

- A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
  - 1. Lay tiles square with room axis.
- B. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
  - 1. Lay tiles with grain running in one direction.
- C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.
- D. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, non-staining marking device.
- F. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- G. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

### 3.4 RESILIENT WALL BASE INSTALLATION

- A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- D. Do not stretch wall base during installation.

- E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.
- F. Pre-molded Corners: Install pre-molded corners before installing straight pieces.

### 3.5 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing resilient product installation:
  - 1. Remove adhesive and other blemishes from exposed surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.
    - a. Do not wash surfaces until after time period recommended by manufacturer.
- B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
  - 1. Apply protective floor polish to horizontal surfaces that are free from soil, visible adhesive, and surface blemishes if recommended in writing by manufacturer.
    - a. Use commercially available product acceptable to manufacturer.
    - b. Coordinate selection of floor polish with Owner's maintenance service.
  - 2. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.
  - 3. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION

SECTION 099113  
EXTERIOR PAINTING

PART 1 - GENERAL

1.2 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:
  - 1. Steel doors.

1.3 SUBMITTALS

- A. Make submissions in accordance with Division 1 Specifications and 'SCHEDULE OF MATERIAL SUBMITTALS', attached at the end of the Specifications.
- B. No deviations, substitutions or changes of materials, to be incorporated into this project, shall be made after approval by the Department, except for written direction by and the approval of the manufacturer of a specific item and re-approval by the Department.
- C. The Department retains the right to require additional items not specifically denoted to be submitted for approval and/or additional clarification.

1.4 QUALITY ASSURANCE

- A. MPI Standards:
  - 1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
  - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

## 1.6 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

## 1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
  - 1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. M.A.B. Paints.
  - 2. Sherwin-Williams Company (The).
  - 3. Or "Approved Equal."

### 2.2 PAINT, GENERAL

- A. Material Compatibility:
  - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Colors: As selected by Government Design Professional from manufacturer's full range.

### 2.3 METAL PRIMERS

- A. Alkyd Anticorrosive Metal Primer: MPI #79.
  - 1. VOC Content: E Range of E2.
- B. Quick-Drying Alkyd Metal Primer: MPI #76.
  - 1. VOC Content: E Range of E2.



## 2.4 EXTERIOR LATEX PAINTS

- A. Exterior Latex (Semigloss): MPI #11 (Gloss Level 5).
  - 1. VOC Content: E Range of E2.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Concrete: 12 percent.
  - 2. Masonry (Clay and CMU): 12 percent.
  - 3. Wood: 15 percent.
  - 4. Plaster: 12 percent.
  - 5. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
  - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

### 3.2 PREPARATION AND APPLICATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- D. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

- E. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.3 EXTERIOR PAINTING SCHEDULE

#### A. Steel Substrates:

1. Quick-Drying Enamel System: MPI EXT 5.1A.
  - a. Prime Coat: Quick-drying alkyd metal primer.
  - b. Intermediate Coat: Quick-drying enamel matching topcoat.
  - c. Topcoat: Quick-drying enamel semigloss.
2. Alkyd System: MPI EXT 5.1D.
  - a. Prime Coat: Alkyd anticorrosive metal primer.
  - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
  - c. Topcoat: Exterior alkyd enamel semigloss.
3. Aluminum Paint System: MPI EXT 5.1K.
  - a. Prime Coat: Alkyd anticorrosive metal primer.
  - b. Intermediate Coat: Aluminum paint.
  - c. Topcoat: Aluminum paint.

END OF SECTION

## SECTION 099123 - INTERIOR PAINTING

### PART 1 - GENERAL

#### 1.2 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following interior substrates:
  - 1. Gypsum board.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product List: For each product indicated, include the following:
  - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
  - 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

#### 1.4 QUALITY ASSURANCE

- A. MPI Standards:
  - 1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
  - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

## 1.6 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

## 1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
  - 1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. M.A.B. Paints.
  - 2. Sherwin-Williams Company (The).
  - 3. "Or Approved Equal"

### 2.2 PAINT, GENERAL

- A. Material Compatibility:
  - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Chemical Components of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions; these requirements do not apply to primers or finishes that are applied in a fabrication or finishing shop:
  - 1. Flat Paints and Coatings: VOC content of not more than 50 g/L.
  - 2. Non-flat Paints and Coatings: VOC content of not more than 150 g/L.

3. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
4. Restricted Components: Paints and coatings shall not contain any of the following:
  - a. Acrolein.
  - b. Acrylonitrile.
  - c. Antimony.
  - d. Benzene.
  - e. Butyl benzyl phthalate.
  - f. Cadmium.
  - g. Di (2-ethylhexyl) phthalate.
  - h. Di-n-butyl phthalate.
  - i. Di-n-octyl phthalate.
  - j. 1,2-dichlorobenzene.
  - k. Diethyl phthalate.
  - l. Dimethyl phthalate.
  - m. Ethylbenzene.
  - n. Formaldehyde.
  - o. Hexavalent chromium.
  - p. Isophorone.
  - q. Lead.
  - r. Mercury.
  - s. Methyl ethyl ketone.
  - t. Methyl isobutyl ketone.
  - u. Methylene chloride.
  - v. Naphthalene.
  - w. Toluene (methylbenzene).
  - x. 1,1,1-trichloroethane.
  - y. Vinyl chloride.

C. Colors: As selected by Government Design Professional from manufacturer's full range.

### 2.3 PRIMERS/SEALERS (1 COAT)

- A. Interior Latex Primer/Sealer: MPI #50.
  1. VOC Content: 200 per liter maximum

### 2.4 METAL PRIMERS

- A. Rust-Inhibitive Primer (Water Based): MPI #107.
  1. VOC Content: 200 per liter maximum

### 2.5 TEX PAINTS (2 COATS)

- A. Interior Latex (Flat): MPI #53 (Gloss Level 1).

1. VOC Content: 100 per liter

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  1. Concrete: 12 percent.
  2. Masonry (Clay and CMU): 12 percent.
  3. Wood: 15 percent.
  4. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
  1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

#### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
  2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
  1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

- E. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- G. Aluminum Substrates: Remove surface oxidation.
- H. Wood Substrates:
  - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
  - 2. Sand surfaces that will be exposed to view, and dust off.
  - 3. Prime edges, ends, faces, undersides, and backsides of wood.
  - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- I. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
  - 1. Use applicators and techniques suited for paint and substrate indicated.
  - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

### 3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove non-complying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

### 3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by t, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.6 INTERIOR PAINTING SCHEDULE

- A. Gypsum Board Substrates:
  1. Latex System: MPI INT 9.2A.
    - a. Prime Coat: Interior latex primer/sealer.
    - b. Intermediate Coat: Interior latex matching topcoat.
    - c. Topcoat: Interior latex (flat).

**END OF SECTION 099123**



## SECTION 099600 – EPOXY FLOOR COATINGS

### PART 1 - GENERAL

#### 1.2 SUMMARY

- A. This Section includes surface preparation and application of high-performance coating systems on the following substrates:
  - 1. Interior Substrates:
    - a. Concrete Floor Slabs

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of finish-coat product indicated.
- C. Product List: For each product indicated. Cross-reference products to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules.

#### 1.4 QUALITY ASSURANCE

- A. Qualifications:
  - 1. The Manufacturer shall have a minimum of 10 years experience in the production, sales, and technical support of methyl methacrylate (MMA) industrial flooring and related materials.
  - 2. The Applicator shall have been approved by the flooring system manufacturer in all phases of surface preparation and application of the product specified.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

## 1.6 PROJECT CONDITIONS

- A. Application may proceed when space conditions, material and substrate temperatures are between 35 F and 90 F providing the substrate temperature is above the dew point. Outside of this range, the Manufacturer shall be consulted.
- B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
- C. The relative humidity in the specific location of the application shall be less than 85 % and the surface temperature shall be at least 5 F above the dew point.
- D. The Applicator shall ensure that adequate ventilation is available for the work area. This shall include the use of manufacturer's approved fans, smooth bore tubing and closure of the work area.
- E. The Applicator shall be supplied with adequate lighting equal to the final lighting level during the preparation and installation of the system.
- F. The Applicator shall be provided with adequate disposal facilities for non-hazardous waste generated during installation of the system.

## Part 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Dur-A-Flex, Inc.
  - 2. Epoxy Systems, Inc.
  - 3. Sherwin-Williams Company; General Polymers.
  - 4. Or Approved Equal

### 2.2 MATERIALS

- A. VOC Content of Resinous Flooring: Provide resinous flooring systems, for use inside the weatherproofing system, that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
  - 1. Epoxy Flooring: 100 g/L.

### 2.3 EPOXY FLOORING

- A. Epoxy Flooring: Waterproof, slip-resistant floor surfacing designed to produce a seamless floor.
- B. System Characteristics:

1. Color and Pattern: As selected by Government Design Professional from manufacturer's full range
  2. Wearing Surface: Textured for slip resistance
- C. Coats:
1. Primer: As required and recommended by the manufacturer for specific application area and substrate.
  2. Base Coat: Minimum of one (1) coat, but as required for specific application area based on manufacturer's recommendation.
  3. Top Coat (Sealing or finish coats): Minimum of one (1) coat, but as required by manufacturer.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
    - a. Concrete: 12 percent.
  2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
  3. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
  4. Coating application indicates acceptance of surfaces and conditions.

#### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
- C. Concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and incompatible paints.
1. Clean surfaces with pressurized water. Use pressure range of 1500 to 4000 psi at 6 to 12 inches.
- D. The substrate shall be sound and all spalls repaired prior to placement of the prime coat. Spalls and cracks shall be repaired with compatible rapid cure concrete patch materials per Manufacturer's recommendations.

- E. There shall be no visible moisture present on the surface at the time of application of the system. Compressed oil-free air and/or a light passing of a propane torch may be used to dry the substrate.
- F. Bond Test:
  - 1. Random tests for adequate bond strength shall be conducted on the substrate while the surface preparation is ongoing and prior to application of the primer, in accordance with the Manufacturer's recommendations, at minimum frequency of three tests per 5,000 sf. Smaller areas shall receive a minimum of three tests.
  - 2. Based on the test results, additional substrate preparation may be required before proceeding with the installation of the system.

### 3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions.
  - 1. Use applicators and techniques suited for coating and substrate indicated.
- B. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.
- C. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.
- D. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the Government Design Professional.
- E. Male and Female Shower Areas: System shall provide proper slope to all new and existing floor drains as depicted on the project design drawings.
- F. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

### 3.4 FIELD QUALITY CONTROL

- A. Government reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when coatings are being applied:
  - 1. Government may direct the Contractor, at no additional cost to engage the services of a qualified testing agency to sample coating material being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
  - 2. Testing agency will perform tests for compliance with specified requirements.
  - 3. Government may direct Contractor to stop applying coatings if test results show materials being used do not comply with specified requirements. Contractor shall remove non-complying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from

previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

B. Tests, Inspection

1. The following tests shall be conducted by the Applicator:

a. Temperature

1. Air, substrate temperatures and, if applicable, dew point.

b. Bond Tests

1. Bond Test of the primer to the substrate shall be checked as per Clause 3.2 C.

c. Coverage Rates

C. Rates for all layers shall be monitored by checking quantity of material used against the area covered.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Government Design Professional, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

**END OF SECTION 099600**

## SECTION 102113 - TOILET COMPARTMENTS

### PART 1 - GENERAL

#### 1.2 SUMMARY

##### A. Section Includes:

1. Solid-polymer toilet compartments configured as toilet enclosures and urinal screens.

#### 1.3 SUBMITTALS

##### A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

##### B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of cutouts for compartment-mounted toilet accessories.
2. Show locations of reinforcements for compartment-mounted grab bars.
3. Show locations of centerlines of toilet fixtures.

##### C. Samples for Initial Selection: For each type of unit indicated. Include Samples of hardware and accessories involving material and color selection.

##### D. Product Certificates: For each type of toilet compartment, from manufacturer.

##### E. Maintenance Data: For toilet compartments to include in maintenance manuals.

#### 1.4 QUALITY ASSURANCE

##### A. Comply with requirements in GSA's CID-A-A-60003, "Partitions, Toilets, Complete."

##### B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 75 or less.
2. Smoke-Developed Index: 450 or less.

- C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1 for toilet compartments designated as accessible.

## 1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M.
- B. Aluminum Extrusions: ASTM B 221.
- C. Brass Castings: ASTM B 584.
- D. Brass Extrusions: ASTM B 455.
- E. Steel Sheet: Commercial steel sheet for exposed applications; mill phosphatized and selected for smoothness.
  - 1. Electrolytically Zinc Coated: ASTM A 879/A 879M, 01Z.
  - 2. Hot-Dip Galvanized: ASTM A 653/A 653M, either hot-dip galvanized or galvanized.
- F. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- G. Stainless-Steel Castings: ASTM A 743/A 743M.
- H. Zamac: ASTM B 86, commercial zinc-alloy die castings.
- I. Particleboard: ANSI A208.1, Grade M-2 with 45-lb density, made with binder containing no urea formaldehyde.
- J. Plastic Laminate: NEMA LD 3, general-purpose HGS grade, 0.048-inch nominal thickness.

### 2.2 SOLID-POLYMER UNITS (Drawings A.1.1 and A.3.1)

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Accurate Partitions Corporation.
  - 2. Bradley Corporation; Mills Partitions.
  - 3. Partition Systems Incorporated of South Carolina.

4. "Or Approved Equal"
- B. Toilet-Enclosure Style: Floor anchored or Floor and ceiling anchored.
- C. Urinal-Screen Style: Wall hung.
- D. Door, Panel, Screen, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.
  1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
  2. Heat-Sink Strip: Manufacturer's standard continuous, stainless-steel strip fastened to exposed bottom edges of solid-polymer components to prevent burning.
  3. Color and Pattern: in each room as selected by Government Design Professional from manufacturer's full range.
- E. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; stainless steel.
- F. Brackets (Fittings):
  1. Stirrup Type: Ear or U-brackets, stainless steel.
  2. Full-Height (Continuous) Type: Manufacturer's standard design..

### 2.3 ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.
  1. Material: Stainless steel.
  2. Hinges: Manufacturer's standard paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
  3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
  4. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.



## 2.4 FABRICATION

- A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- B. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- C. Floor-and-Ceiling-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.
- D. Door Size and Swings: Unless otherwise indicated, provide 24-inch wide, in-swinging doors for standard toilet compartments and 36-inch wide, out-swinging doors with a minimum 32-inch wide, clear opening for compartments designated as accessible.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
  - 1. Maximum Clearances:
    - a. Pilasters and Panels: 1/2 inch.
    - b. Panels and Walls: 1 inch.
  - 2. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel.
    - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
    - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.

- D. Floor-and-Ceiling-Anchored Units: Secure pilasters to supporting construction and level, plumb, and tighten. Hang doors and adjust so doors are level and aligned with panels when doors are in closed position.
- E. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

### 3.2 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

**END OF SECTION 102113**

## SECTION 102800 - TOILET ROOM ACCESSORIES

### PART 1 GENERAL

#### 1.2 SUMMARY

A. This Section includes the following:

1. Washroom accessories.
2. Underlavatory guards.

#### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.
5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated on associated floor plans..
2. Identify products using designations indicated within the large scale toilet room details..

C. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

#### 1.4 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Government Design Professional.

#### 1.5 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

## 1.6 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.

- 1. Warranty Period: 15 years from date of Substantial Completion.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.
- B. Brass: ASTM B 19 flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-inch minimum nominal thickness.
- D. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- E. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
- I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

### 2.2 WASHROOM ACCESSORIES

- 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. Kimberly-Clark Professional (Government Preferred)
  - 2. "Or Approved Equal"
- B. Toilet Tissue (Roll) Dispenser (KC Model: 09612)

1. Description: Single-Jumbo roll dispenser.
2. Mounting: Surface mounted.
3. Operation: Noncontrol delivery with standard spindle.
4. Capacity: Designed to dispense 9." dia tissue rolls
5. Material and Finish: ABS Plastic in Smoke Grey.

C. Paper Towel (Roll) Dispenser (KC Model: 09736)

1. Description: Lever-actuated mechanism permits controlled delivery of paper rolls in preset lengths per stroke.
2. Mounting: Surface mounted.
3. Capacity: 8-inch wide with 1.5" core
4. Material and Finish: ABS plastic, Smoke Grey.
5. Lockset: Key Activated

D. Liquid-Soap Dispenser (KC Model: 91180)

1. Description: Designed for dispensing soap in liquid or lotion form.
2. Mounting: Vertically oriented, surface mounted.
3. Capacity: 500 or 1000ml (1 pack).
4. Lockset: Keyless lock.
5. Refill Indicator: Window type.

E. Grab Bars:

1. Mounting: Flanges with concealed fasteners.
2. Material: Stainless steel, 0.05 inch thick.
  - a. Finish: Smooth, No. 4, satin finish.
3. Outside Diameter: 1-1/2 inches.
4. Configuration and Length: As indicated on Drawings.

F. Mirror Unit (American Specialties Model: 0600)

1. Frame: Stainless-steel angle, 0.05 inch thick.
  - a. Corners: Manufacturer's standard.
2. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
  - a. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
  - b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
3. Size: As indicated on Drawing A.2.1.

## 2.3 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of **three** keys to Owner's representative.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

#### 3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

**END OF SECTION 102800**

SECTION 123530 – MANUFACTURED CABINETS AND COUNTERTOPS

PART 1 – GENERAL

1.2 SCOPE OF WORK OUTLINE

- A. The work under this Section shall generally consist of, but not necessarily be limited to, providing all labor, material, devices, tools and equipment required for installation of:
  - 1. Kitchen cabinets
  - 2. Countertop
- B. All work under this Section shall be coordinated with and in compliance with all work of other trades and DIVISIONS of this Specification.

1.3 REFERENCES/ACRONYMS

- A. The following referenced material shall apply to this specification and have the same force and effect as if printed in full herein:
  - 1. KCMA A 161.1
  - 2. KCMA A161.2

1.4 SUBMITTALS

- A. Make submissions in accordance with ‘SCHEDULE OF MATERIAL SUBMITTALS’, attached at end of the Specifications.
- B. No deviations, substitutions or changes of materials, to be incorporated into this project, shall be made after approval by the Department, except for written direction by and the approval of the manufacturer of a specific item and re-approval by the Department.
- C. The Department retains the right to require additional items not specifically denoted to be submitted for approval and/or additional clarification.

1.5 QUALITY ASSURANCE

- A. All materials under this Section shall be factory certified, first run material, seconds will not be permitted.
- B. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Provide fillers and scribes to allow for trimming and fitting, if necessary.

- C. Field verify measurements for countertop after base cabinets are installed, but prior to countertop fabrication.

#### 1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original unopened packaging and/or containers labeled with the manufacturer's name, model number, brand name, installation instructions, storage conditions and lot numbers.
- B. Store and protect materials from damage and weather in accordance with manufacturer's instructions, except as specified otherwise.
- C. The Department shall accept absolutely no liability for any materials stored on site. It shall be the complete responsibility of the Contractor to provide whatever means necessary to properly secure and protect any and all stored materials.
- D. Any materials damaged either during shipping or storage at the site shall be replaced at Contractor's expense.
- E. Do not store adhesive containers with opened lids.

#### 1.7 REMOVAL OF NON-COMPLIANT MATERIALS

- A. Any material found not to be in compliance with the requirements of this Section, through testing and/or other means, whether installed individually and/or as a part of a system or not, shall be immediately removed from the job site and replaced with compliant materials at no additional cost to the Contract.

### PART 2 – PRODUCTS

#### DISCLAIMER:

Items specified by specific name of a manufacturer are only to establish a standard for operation, quality, characteristics, type, performance, etc. Equal products by other manufacturers will be considered for inclusion into this project provided they are submitted with sufficient supporting data/information which to base a decision for approval. In certain cases, which will be so noted, specified items **must** be used in order to be compatible with existing systems.

#### 2.1 CABINET MATERIAL

##### A. General

1. Adhesives: Do not use adhesives that contain urea formaldehyde.
2. Hardwood Lumber: Kiln dried to 7 percent moisture content.
3. Softwood Lumber: Kiln dried to 10 percent moisture content. Hardwood Plywood:
4. HPVA HP-Particleboard: ANSI A208.1, Grade M-2
5. Medium-Density Fiberboard: ANSI A208.2, Grade MD
6. Hardboard: AHA A135.4, Class 1 Tempered.



- B. Exposed Wood Species: Maple, Birch, Oak or Hickory
  - 1. All cabinets shall be of the same species.
  - 2. Adjacent exposed cabinet surfaces shall be similar in color, grain, figure, or natural character markings.
  - 3. Staining and Finish: Color to be selected by Department.
- C. Solid Wood: Clear hardwood lumber of species indicated, free of defects.
- D. Plywood: Hardwood plywood with face veneer of species indicated, with Grade A faces and Grade C backs of same species as faces.
- E. Semi-exposed Materials: Unless otherwise indicated, provide the following:
  - 1. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects. Same species as exposed surfaces.
  - 2. Plywood: Hardwood plywood with Grade C faces and not less than Grade 3 backs of same species as faces. Face veneers of same species as exposed surfaces.
- F. Concealed Materials: Solid wood or plywood, of any hardwood or softwood species, with no defects affecting strength or utility; particleboard; medium-density fiberboard; or hardboard.

## 2.2 CABINET HARDWARE

- A. General: Manufacturer's standard units complying with BHMA A156.9, of type, size, style, material, and finish as selected by Department from manufacturer's full range.
- B. Pulls: Surface-mounted decorative pulls as selected by Department from manufacturer's full range.
- C. Hinges: Concealed butt hinges
- D. Drawer Guides: Epoxy-coated-metal, self-closing drawer guides; designed to prevent rebound when drawers are closed; with nylon-tired, ball-bearing rollers; and complying with BHMA A156.9, Type B05011 or B05091.

## 2.3 COUNTERTOP MATERIAL

- A. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3.
  - 1. Colors, Textures, and Patterns: As selected by Department.
- B. Particleboard: ANSI A208.1, Grade M-2
- C. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.
- D. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.

- E. Type: Provide Standard Type Countertop with pre-molded backsplash
- F. Provide and install laminate ends for all exposed countertop ends to match countertop laminate.
  - 1. Provide adhesive to install laminate ends as recommended by countertop manufacturer.

## 2.4 CABINETS

- A. Face Style: Flush overlay
- B. Cabinet Style: Frameless
- C. Door and Drawer Fronts: Solid-wood stiles and rails, with 3/4-inch thick, solid-wood center panels.
- D. Face Frames: 3/4-by-1-5/8-inch solid wood.
- E. Exposed Cabinet End Finish: Wood veneer

## 2.5 PLASTIC-LAMINATE COUNTERTOPS

- A. Configuration: Provide countertops with the following front, cove (intersection of top with backsplash), backsplash, and end splash style:
  - 1. Front: Rolled
  - 2. Cove: Cove molding one-piece post-formed laminate supported at junction of top and backsplash by wood cove molding
  - 3. Backsplash: Curved
  - 4. End-splash: None

# PART 3 – EXECUTION

## 3.1 INSTALLATION

- A. Install cabinets with no variations in flushness of adjoining surfaces; use concealed shims. Where cabinets abut other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match cabinet face.
- B. Install cabinets without distortion so doors and drawers fit openings and are aligned. Complete installation of hardware and accessories as indicated.
- C. Install casework level and plumb to a tolerance of 1/8 inch in 8 feet.
- D. Fasten cabinets to adjacent units and to backing.
  - 1. Fasten wall cabinets through back, near top and bottom, at ends and not less than 24 inches o/c. with No. 10 wafer-head screws sized for 1-inch penetration into framing, blocking, or hanging strips.

- E. Fasten plastic-laminate countertops by screwing through corner blocks of base units into underside of countertop. Form seams using splines to align adjacent surfaces, and secure with glue and concealed clamping devices designed for this purpose.
- F. Adjust cabinets and hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

**END OF DIVISION**

SECTION 311000  
SITE CLEARING

PART 1 - GENERAL

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions.

1.3 SUMMARY

- A. This Section includes the following:

- 1. Protecting existing trees and grass to remain.
- 2. Removing above- and below-grade site improvements.
- 3. Temporary erosion and sedimentation control measures.

- B. Related Sections include the following:

- 1. Division 31 Section "EARTH MOVING" for soil materials, excavating, backfilling, and site grading.

1.4 DEFINITIONS

- A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 1 inch in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.
- B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

## 1.5 MATERIAL OWNERSHIP

- A. Except for stripped topsoil and excess satisfactory soil, or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

## 1.6 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without coordination with the Department and authorities having jurisdiction. Coordinate any adjusted traffic alterations with the Department at least 3 days prior to the completion of the work.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- B. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly flag trees and vegetation to remain or to be relocated.
- C. Protect existing site improvements to remain from damage during construction.
  - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

### 3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to the drawings.
- B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

- C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

### 3.3 TREE PROTECTION

- A. Do not excavate within tree protection zones, unless otherwise indicated.
- B. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
- C. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by the Department.
  - 1. Replace trees that cannot be repaired and restored to full-growth status, as determined by the Department.

### 3.4 UTILITIES

- A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
- B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify the Department not less than three days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without the Department's written permission.

### 3.5 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
- B. Remove concrete structures, slabs, paving, curbs, gutters, and aggregate base as indicated.
  - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
  - 2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

### 3.6 DISPOSAL

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property, unless indicated otherwise within the contract documents.
  - 1. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION

SECTION 312000  
EARTH MOVING

PART 1 - GENERAL

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions.

1.3 SUMMARY

- A. This Section includes the following:

- 1. Preparing sub-grades for walks, pavements, lawns and grasses.
- 2. Excavating for utilities and other improvements.

- B. Related Sections include the following:

- 1. Division 32 Section "Turf and Grasses" for finish grading, including preparing and placing topsoil and planting soil for lawns.

1.4 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
- B. Base Course: Course placed between the sub-base course and hot-mix asphalt paving.
- C. Bedding Course: Course placed over the excavated sub-grade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above sub-grade elevations and to lines and dimensions indicated.



1. Authorized Additional Excavation: Excavation below sub-grade elevations or beyond indicated lines and dimensions as directed by Department. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
3. Unauthorized Excavation: Excavation below sub-grade elevations or beyond indicated lines and dimensions without direction by Department. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Suitable soil materials used to raise existing grades.

H. Rock: Rock material in beds, ledges, un-stratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- wide, maximum, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,090 lbf and stick-crowd force of not less than 18,650 lbf ; measured according to SAE J-1179.
2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp flywheel power and developing a minimum of 48,510-lbf breakout force with a general-purpose bare bucket; measured according to SAE J-732.

I. Sub-base Course: Course placed between the sub-grade and base course for hot-mix asphalt pavement, or course placed between the sub-grade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Sub-grade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below sub-base, drainage fill, or topsoil materials.

## 1.5 SUBMITTALS

- A. Make submissions in accordance with 'SCHEDULE OF MATERIAL SUBMITTALS', attached at end of the Specifications.
- B. No deviations, substitutions or changes of materials, to be incorporated into this project, shall be made after approval by the Department, except for written direction by and the approval of the manufacturer of a specific item and re-approval by the Department.
- C. The Department retains the right to require additional items not specifically denoted to be submitted for approval and/or additional clarification.

## 1.6 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548. All materials under this Section shall be factory certified, first run material, seconds will not be permitted and be certified according to PENNDOT Specification 408.
- B. Non-Compliant Materials - Any material found not to be in compliance with the requirements of the contract documents, through testing and/or other means, whether installed individually and/or as a part of a system or not, shall be immediately removed from the job site and replaced with compliant materials at no additional cost to the Contract.
- C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
  - 1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
  - 2. Laboratory compaction curve according to ASTM D 698 for each on-site and borrow soil material proposed for fill and backfill.
  - 3. Compaction Density Test Reports according to ASTM D 2922 – Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- D. Aggregate Material Tests: Conduct aggregate material quality tests in accordance with the following:
  - 1. PDT Section 703.1, Fine Aggregate
  - 2. PDT Section 703.2, Coarse Aggregate
  - 3. PDT Section 703.3 Select Granular Material (2RC)

## 1.7 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Department and then only after arranging to provide temporary utility services according to requirements indicated.
  - 1. Notify Department not less than three days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Department's written permission.
  - 3. Contact utility-locator service for area where Project is located before excavating.

## PART 2 - PRODUCTS

2.1 **DISCLAIMER:** Items specified by specific name of a manufacturer is only to provide a guide to type, performance quality, characteristics, etc. Equal products by manufacturers not specified will be considered for inclusion into this project provided that they are submitted with sufficient supporting data/information on which to base a decision for approval. In certain cases, which will be so noted, specific items **must** be used in order to be compatible with existing systems.

### 2.2 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM AASHTO M 145 Soil Classification Groups A-1, A-2-4, A-2-5, and A-3, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487 A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a combination of these groups.
  - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Sub-base Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- H. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Preparation of sub-grade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 2 Section "Site Clearing."
- C. Protect and maintain erosion and sedimentation controls, which are specified in Division 2 Section "Site Clearing," during earthwork operations.
- D. Provide protective insulating materials to protect sub-grades and foundation soils against freezing temperatures or frost.

### 3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared sub-grades, and from flooding Project site and surrounding area.
- B. Protect sub-grades from softening, undermining, washout, and damage by rain or water accumulation.
  - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
  - 2. Install a dewatering system to keep sub-grades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

### 3.3 EXPLOSIVES

- A. Explosives: Explosives may not be used for any part of this project.

### 3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to sub-grade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
  - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

### 3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
  - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
  - 2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended as bearing surfaces.

### 3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and sub-grades.

### 3.7 SUBGRADE INSPECTION

- A. Notify Department when excavations have reached required sub-grade.
- B. If the contractor encounters unforeseen sub-grade conditions that are considered unsatisfactory for construction or that do not meet compaction requirements, they will notify the department prior to any further excavation or site construction. If the Department determines that unforeseen unsatisfactory sub-grade is present, they will determine the additional work to be completed and submit a change order request through the contracting officer.
- C. Proof-roll sub-grade below the pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated sub-grades.
  - 1. Completely proof-roll sub-grade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph .
  - 2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons .
  - 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
- E. Reconstruct sub-grades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Department, without additional compensation.

### 3.8 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Surveying locations of underground utilities for Record Documents.
2. Removing trash and debris.
3. Construction below finish grade including, where applicable, sub-drainage, damp-proofing, waterproofing, and perimeter insulation.
4. Testing and inspecting underground utilities.
5. Removing concrete formwork.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on sub-grades free of mud, frost, snow, or ice.

### 3.9 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under walks and pavements, use satisfactory soil material.

C. Place soil fill on sub-grades free of mud, frost, snow, or ice.

### 3.10 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate sub-grade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

### 3.11 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under structures, building slabs, steps, and pavements, scarify and re-compact top 12 inches of existing sub-grade and each layer of backfill or fill soil material at 95 percent.

2. Under walkways, scarify and re-compact top 6 inches below sub-grade and compact each layer of backfill or fill soil material at 92 percent.
3. Under lawn or unpaved areas, scarify and re-compact top 6 inches below sub-grade and compact each layer of backfill or fill soil material at 85 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent. Utility trenches within a pavement area shall be compacted according to #1 above.

### 3.12 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
  1. Provide a smooth transition between adjacent existing grades and new grades.
  2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish sub-grades to required elevations within the following tolerances:
  1. Lawn or Unpaved Areas: Plus or minus 1/2 inch.
  2. Walks: Plus or minus 1/2 inch .
  3. Pavements: Plus or minus 1/4 inch.

### 3.13 SUBBASE AND BASE COURSES

- A. Place sub-base and base course on sub-grades free of mud, frost, snow, or ice.
- B. On prepared sub-grade, place sub-base and base course under pavements and walks as follows:
  1. Install separation geotextile on prepared sub-grade according to manufacturer's written instructions, overlapping sides and ends.
  2. Place base course material over sub-base course under hot-mix asphalt pavement.
  3. Shape sub-base and base course to required crown elevations and cross-slope grades.
  4. Place sub-base and base course 6 inches or less in compacted thickness in a single layer.
  5. Place sub-base and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  6. Compact sub-base and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

### 3.14 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test sub-grades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Footing Sub-grade: At footing sub-grades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing sub-grades may be based on a visual comparison of sub-grade with tested sub-grade when approved by the Department.
- D. Testing agency will test compaction of soils in place according to ASTM D 2922 as applicable. Tests will be performed at the following locations and frequencies:
  - 1. Paved and Building Slab Areas: At sub-grade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. (186 sq. m) or less of paved area or building slab, but in no case fewer than 3 tests.
  - 2. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test for each 100 feet (30 m) or less of wall length, but no fewer than 2 tests.
  - 3. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet (46 m) or less of trench length, but no fewer than 2 tests.
- E. When testing agency reports that sub-grades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; re-compact and retest until specified compaction is obtained.
- F. The contractor will provide the Department with copies of all test reports prior to final backfill and certification of calibration of nuclear density gauge.

### 3.15 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
  - 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and re-compact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.



1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

### 3.16 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Department's property.
  1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Department's property.
  2. The Department will retain all satisfactory soils originated from Ft. Indiantown Gap.

END OF SECTION

SECTION 329200  
TURFS and GRASSES

PART 1 - GENERAL

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions.

1.3 SUMMARY

- A. This Section includes the following:
  - 1. Seeding.
- B. Related Sections include the following:
  - 1. Division 31 Section "Site Clearing" for topsoil stripping and stockpiling.
  - 2. Division 31 Section "Earth Moving" for excavation, filling and backfilling, and rough grading.

1.4 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- C. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- D. Sub-grade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

1.5 SUBMITTALS

- A. Make submissions in accordance with 'SCHEDULE OF MATERIAL SUBMITTALS' attached at end of the Specifications.
- B. No deviations, substitutions or changes of materials, to be incorporated into this project, shall be made after approval by the Department, except for written direction by and the approval of the manufacturer of a specific item and re-approval by the Department.
- C. The Department retains the right to require additional items not specifically denoted to be submitted for approval and/or additional clarification.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawn establishment.
  - 1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.
- B. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
  - 1. Report suitability of topsoil for lawn growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a satisfactory topsoil.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

#### 1.8 SCHEDULING

- A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

#### 1.9 LAWN MAINTENANCE

- A. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
  - 1. Seeded Lawns: 60 days from date of Substantial Completion.

- a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.
- B. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.
  - 1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch. Anchor as required to prevent displacement.
- C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawn uniformly moist to a depth of 4 inches (100 mm).
  - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
  - 2. Water lawn at a minimum rate of 1 inch (25 mm) per week.
- D. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 40 percent of grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
  - 1. Mow grass 2 to 3 inches (38 to 50 mm) high.
- E. Lawn Postfertilization: Apply fertilizer after initial mowing and when grass is dry.
  - 1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) to lawn area.

## PART 2 - PRODUCTS

- 2.1 **DISCLAIMER:** Items specified by specific name of a manufacturer is to only provide a standard for characteristics, type, quality, performance, etc. Equal products by manufacturers not specified will be considered for inclusion into this project provided that they are submitted with sufficient supporting data/information on which to base a decision for approval. In certain cases, which will be so noted, specific items **must** be used in order to be compatible with existing systems.
- 2.2 Manufacturer's
  - A. Seedway, Inc.
  - B. Or Approved Equal

## 2.3 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

1. Seed Species: PENNDOT 408, Section 804 – Formula L

## 2.4 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 2 percent organic material content; free of stones  $\frac{3}{4}$ " inch (25 mm) or larger in any dimension and other extraneous materials harmful to plant growth.

1. Topsoil Source: Off-site Topsoil will not be required. Verify suitability of topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
  - a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from agricultural land, bogs or marshes.

## 2.5 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:

1. Class: Class T, with a minimum 99 percent passing through No. 8 (2.36-mm) sieve and a minimum 75 percent passing through No. 60 (0.25-mm) sieve.

## 2.6 FERTILIZER

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

## 2.7 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas to receive lawns and grass for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
- B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

### 3.3 LAWN PREPARATION

- A. Limit lawn subgrade preparation to areas to be planted.
- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches (150 mm). Remove stones larger than 3/4 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
  - 1. Apply fertilizer directly to subgrade before loosening.
  - 2. Thoroughly blend planting soil mix off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.
    - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
    - b. Mix lime with dry soil before mixing fertilizer.
  - 3. Spread planting soil mix to a depth of 6 inches (150 mm) but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
    - a. Spread approximately one-half the thickness of planting soil mix over loosened subgrade. Mix thoroughly into top 4 inches (100 mm) of subgrade. Spread remainder of planting soil mix.
- C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.
- D. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

- E. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

### 3.4 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
  - 1. Do not use wet seed or seed that is moldy or otherwise damaged.
- B. Sow seed at the rate of 4 lb/1000 sq. ft. (1.4 to 1.8 kg/92.9 sq. m).
- C. Rake seed lightly into top 1/8 inch (3 mm) of topsoil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes exceeding 4:1 with erosion-control blankets installed and stapled according to manufacturer's written instructions.
- E. Protect seeded areas with slopes not exceeding 6:1 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre (42 kg/92.9 sq. m) to form a continuous blanket 1-1/2 inches (38 mm) in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.

### 3.5 SATISFACTORY LAWNS

- A. Satisfactory Seeded Lawn: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 80 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm).
- B. Reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

### 3.6 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.
- C. Remove erosion-control measures after grass establishment period.

END OF SECTION

SCHEDULE OF MATERIAL SUBMITTALS <b>Architectural Submittals</b>												PROJECT NUMBER <b>DMVA 42160105</b>	PROJECT TITLE <b>Lock Haven FMS HVAC &amp; Exhaust Replacement</b>	SOLICITATION/CONTRACT NUMBER							
TO BE COMPLETED BY PROJECT ENGINEER												TO BE COMPLETED BY CONTRACT ADMINISTRATOR									
LINE NUMBER	ITEM OR DESCRIPTION OF ITEM, CONTRACT REFERENCE, TYPE OF SUBMITTAL	NUMBER OF COPIES REQUIRED										REQUIRED SUBMISSION DATE	DATE RECEIVED IN CONTRACTING	DATE TO CIVIL ENGINEERING	RETURN SUSPENSE DATE	SUBMITTAL NUMBERS	DATE CONTRACTOR NOTIFIED		CONTRACTOR RESUBMITTAL	FINAL APPROVAL	REMARKS
		CERTIFICATE OF COMPLIANCE	SHOP DRAWINGS	SAMPLES	COLOR SELECTION	MANUFACTURER'S RECOMMENDATIONS	MANUFACTURER'S WARRANTY	CATALOG DATA	OPERATING INSTRUCTIONS	Reports	Batch Slips						Steel Certifications	APPROVED			
1	033000 Concrete	1								1	1										
2	055213 Pipe & Tube Railings		5									3									
3	079200 Joint Sealant	5			2	5	5	5													
4	081113 Hollow Metal Doors and Frames		5		2	5	5	5				3									
5	087100 Door Hardware				2		5	5	5												
6	092216 NLB Steel Studs							5				3									
7	092900 Gypsum Board	5				5	5	5													
8	095123 Acoustical Tile Ceiling				2	5	5	5													
9	096519 Resilient Floor Tile (VCT)				2	5	5	5													
10	099113 Exterior Paint				2	5	5	5													
11	099123 Interior Paint				2	5	5	5													
12	099600 Epoxy Floor Coating				2	5	5	5													
17	102113 Toilet Compartments		5		2	5	5	5													
18	102800 Toilet Room Accessories				2	5	5	5													



**SCHEDULE OF MATERIAL SUBMITTALS**  
**Architectural Submittals**

PROJECT NUMBER  
**DMVA  
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HVAC & Exhaust  
Replacement**

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		CERTIFICATE OF COMPLIANCE	SHOP DRAWINGS	SAMPLES	COLOR SELECTION	MANUFACTURER'S RECOMMENDATIONS	MANUFACTURER'S WARRANTY	CATALOG DATA	OPERATING INSTRUCTIONS	Reports	Batch Slips						Steel Certifications	APPROVED				DIS-APPROVED
19	123530 Cabinets and Countertops	5	5		2	5	5	5														
20	As-Built drawings. CAD & printed versions ( 1 Set )																					



SECTION 230500

COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.2 RELATED DOCUMENTS

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

1.3 SUMMARY

- A. This Section includes the following:

- 1. Piping materials and installation instructions common to most piping systems.
- 2. Dielectric fittings.
- 3. Sleeves.
- 4. Escutcheons.
- 5. Equipment installation requirements common to equipment sections.
- 6. Painting and finishing.
- 7. Supports and anchorages.
- 8. Cast-in-Place Concrete.
- 9. Mechanical Demolition.

1.4 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. 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.

## 1.5 SUBMITTALS

- A. Product Data: For the following if utilized:
  - 1. Transition fittings.
  - 2. Dielectric fittings.
- B. Steel Certifications.

## 1.6 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.

## 1.7 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.

## 1.8 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.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

### 2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

### 2.3 JOINING MATERIALS

- A. Refer to individual Division 23 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
  - 2. AWWA C110, rubber, flat face, 1/8-inch-thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

- E. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

## 2.4 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

- B. Insulating Material: Suitable for system fluid, pressure, and temperature.

- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

- 1. Manufacturers:

- a. Eclipse, Inc.
- b. Epcos Sales, Inc.
- c. Hart Industries, International, Inc.
- d. Watts Industries, Inc.; Water Products Div.
- e. Zurn Industries, Inc.; Wilkins Div.

- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

- 1. Manufacturers:

- a. Capitol Manufacturing Co.
- b. Epcos Sales, Inc.
- c. Watts Industries, Inc.; Water Products Div.

- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

- 1. Manufacturers:

- a. Advance Products & Systems, Inc.
- b. Calpico, Inc.
- c. Pipeline Seal and Insulator, Inc.

- 2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

- F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

- 1. Manufacturers:

- a. Calpico, Inc.
- b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

1. Manufacturers:

- a. Perfection Corp.
- b. Precision Plumbing Products, Inc.
- c. Victaulic Co. of America.

## 2.5 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- D. PVC Pipe: ASTM D 1785, Schedule 40.

## 2.6 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: Rough brass.
- D. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.

## 2.7 GROUT

- A. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.
  1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  2. Design Mix: 5000-psi, 28-day compressive strength.
  3. Packaging: Premixed and factory packaged.

## 2.8 CAST-IN-PLACE CONCRETE

- A. Normal-Weight Concrete: Prepare design mixes, proportioned according to ACI 301, as follows:

1. Minimum Compressive Strength: 3000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
4. Slump Limit: 4 inches, plus or minus 1 inch.
5. Air Content: Maintain within range permitted by ACI 301 (ACI 301M). Do not allow air content of trowel-finished floor slabs to exceed 3 percent.

### PART 3 - EXECUTION

#### 3.1 MECHANICAL DEMOLITION

- A. Refer to Division 1 Sections "Cutting and Patching" and "Selective Demolition & Restoration" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.
  1. Equipment to Be Removed: Disconnect and cap services and remove equipment.
  2. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
  3. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

#### 3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe 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. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    - c. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
- M. Sleeves are not required for core-drilled holes.
- N. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
  - 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
    - b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
  - 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.
- O. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Verify final equipment locations for roughing-in.
- P. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### 3.3 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. 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.
- F. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

### 3.4 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
  - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
  - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
  - 3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

### 3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

- C. Install 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.

### 3.6 PAINTING

- A. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### 3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.
- B. Field Welding: Comply with AWS D1.1.

### 3.8 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.

### 3.9 CONCRETE PLACEMENT

- A. Comply with ACI 301 for placing concrete.
- B. Do not add water to concrete during delivery, at Project site, or during placement.
- C. Consolidate concrete with mechanical vibrating equipment.

END OF SECTION 230500

## SECTION 230510

### HVAC ELECTRICAL EQUIPMENT AND WIRING REQUIREMENTS

#### PART 1 - GENERAL

##### 1.2 RELATED DOCUMENTS

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

##### 1.3 ELECTRICAL EQUIPMENT

###### A. General:

1. This Contractor shall furnish all motors, starters, disconnects for motors and heating coils and controls for equipment under his Contract, unless otherwise noted.
2. Electrical Contractor shall install all starters, disconnects and overload protectors furnished by this Contractor and shall provide all necessary wire, conduit and boxes to properly connect equipment for this Contractor no matter how many disconnects, starters, etc. are included, unless otherwise noted.
3. This Contractor shall provide all necessary conduit and control wiring to pushbuttons, thermostats, pilot lights, interlocks and similar equipment for this Contractors equipment.
4. Flow control switches, thermostats and similar mechanical-electrical devices necessary for proper operation of mechanical systems shall be furnished and installed by this Contractor.
5. Where the starter and/or safety switch is an integral part of the equipment assembly, the assembly shall be furnished with the wiring complete between starter, controller and motor. The Electrical Contractor will make connections to unit terminals.
6. If motor control center is furnished (and installed) by Electrical Contractor for specific motors, the Mechanical Contractor shall not furnish starters for those specific motors, however the Mechanical Contractor shall furnish Electrical Contractor with starter requirements to insure proper operation of those motors.

7. All motors and motor control equipment and wiring shall meet the requirements of the NEC and shall comply with the requirements of the Public Utility Company furnishing service and with the rules and regulations of all authorities having jurisdiction.
8. Voltage available at the building is 120/240 volts - single phase – three wires.
9. THIS CONTRACTOR SHALL VERIFY VOLTAGE AT SITE BEFORE ORDERING ANY ELECTRICAL EQUIPMENT.

## PART 2 - PRODUCTS

### 2.1 CONTROL WIRING

- A. All wiring and conduit shall be according to the latest edition of the NEC. All control wiring shall be installed in EMT, applicable portions of the NEC and of "DIVISION 16 - ELECTRICAL".
- B. Low voltage control wiring in air plenums shall be a UL approved conductor for application as manufactured by Alpha or Beldon.

### 2.2 STARTERS/DISCONNECTS

- A. Starters shall be combination disconnect type.
- B. Combination motor starters shall be of the fused switch type complete with magnetic motor starter. Unit shall be of the NEMA Class and size as applicable to motor size, with 3-pole overload. Overload elements and fuses shall be of the proper size to protect the motor. Unless otherwise noted, units shall be equipped with indicating lights, HAND-OFF-AUTOMATIC selector switch, four (4) auxiliary contacts (two N.O. and two N.C.) and fused control transformer to provide 24-volt control voltage.
- C. Fusible disconnect switch operating handles shall be interlocked with the door so that the door cannot be opened with the switch in the ON position, except through a hidden release mechanism. The operating handle shall be arranged for padlocking in the OFF position with up to three padlocks. Fuses shall be furnished by this contractor, of size required to comply with NEC. Where R type fuses are indicated, fuse holders shall be provided with rejection clips.
- D. The control circuit shall be wired for 24-volt control, using fused individual control transformers. Circuit shall be fused and shall be interrupted when disconnect device is opened.
- E. Combination Motor Starter Manufacturer: Except where an item of mechanical equipment must be integrally furnished with a motor starter produced by another manufacturer, provide combination starters for mechanical equipment manufactured by a single one of the following:
  1. Allen-Bradley Co.
  2. Cutler-Hammer, Inc.
  3. General Electric Co.
  4. Square D Co.

- 5. Westinghouse Electric Co.
- F. All starters shall automatically restart if there is a power outage.
- G. Reduced voltage starters shall be provided to comply with power company limitations on inrush current. Refer to electrical drawings or power company for limitations. When reduced voltage starters are to be provided, this information must be given to Electrical Contractor and he must include the cost of connecting these starters in his bid.
- H. Units shall have NEMA type 1 enclosure (unless noted otherwise) and as required to comply with NEC.

### PART 3 - EXECUTION

#### 3.1 CONTROL WIRING

- A. Workmanship on all phases of control wiring shall be equal to that of the Electrical Contractor and shall be performed by competent workmen.
- B. Horizontal cable runs shall be made level. Vertical cable runs shall be made plumb. Exposed cable runs shall run parallel or perpendicular to walls and ceilings, i.e., no unsightly diagonals or bends.
- C. In building equipment spaces, cables may be run along and strapped to the surface of walls using mechanical fasteners with wire ties.
- D. Horizontal cable runs shall be supported every 12 inches, and vertical cable runs shall be supported every 24 inches. Cables will be run in a workmanlike manner parallel to the floor with all droops removed by pulling taut but without exceeding the tensile strength of the conductors.
- E. Cable runs may not be run along or fastened to: any telephone cable superstructure, including those supported from the ceiling, from the wall, or on top of the telephone equipment frames; any air handling ductwork beyond fifteen feet from the supply or return fan; any fluid or gas piping.
- F. Cables shall be concealed unless permission is otherwise solicited from the Professional and granted in writing.

#### 3.2 RESPONSIBILITIES

- A. The following is a list of equipment provided by this Contractor and shows both this Contractor's and the Electrical Contractor's responsibility for the furnishing, installing and connection of control, disconnecting and overload equipment.
- B. The conditions under Electrical Equipment, General (above) also apply to these paragraphs.
- C. Provide to the Electrical Contractor shop drawings, product data, and manufacturer's instructions for equipment furnished under DIVISION 23.

1. Vehicle Exhaust Fans with motorized reel - Manually Controlled
  - a. 240-volt, 1 phase.
  - b. Starters with overload protection shall be furnished and installed by equipment manufacturer.
  - c. The Electrical Contractor shall furnish, install and connect all power wiring to a non-fused disconnect switch supplied by the equipment manufacturer.
  - d. All wiring to the respective devices in the unit shall be factory installed by the equipment manufacturer.
  - e. Internally mounted control center with motor starters, 24 VAC control transformers and control circuit fusing shall be provided by equipment manufacturer.
2. Energy Recovery Ventilator (Outdoor)
  - a. 230-volt - 1 phase.
  - b. Starters with overload protection shall be furnished and installed by equipment manufacturer.
  - c. The Electrical Contractor shall furnish, install and connect all power wiring to a fused weatherproof disconnect switch supplied by the equipment manufacturer.
  - d. All wiring to the respective devices in the unit shall be factory installed by the equipment manufacturer.
  - e. Internally mounted control center with motor starters, 24 VAC control transformers and control circuit fusing shall be provided by equipment manufacturer.
3. Mini-Split Heat Pump (Outdoor)
  - a. 230-volt - 1 phase.
  - b. Starters with overload protection shall be furnished and installed by equipment manufacturer.
  - c. The Electrical Contractor shall furnish, install and connect all power wiring to a fused weatherproof disconnect switch supplied by the equipment manufacturer.
  - d. All wiring to the respective devices in the unit shall be factory installed by the equipment manufacturer.
  - e. Internally mounted control center with motor starters, 24 VAC control transformers and control circuit fusing shall be provided by equipment manufacturer.
4. LP Gas Fired Infrared Heater
  - a. 120-volt, 1 phase.
  - b. Starters with overload protection shall be furnished and installed by equipment manufacturer.
  - c. The Electrical Contractor shall furnish and install a thermal switch, circuit as indicated.
  - d. All wiring to the respective devices in the unit shall be factory installed by the equipment manufacturer.
  - e. Internally mounted control center with motor starters, 24 VAC control transformers and control circuit fusing shall be provided by equipment manufacturer.

END OF SECTION 230510

SECTION 230553

IDENTIFICATION FOR HVAC PIPING, DUCTS AND EQUIPMENT

PART 1 - GENERAL

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Duct labels.
4. Valve tags.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- C. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:



1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8-inch-thick, and having predrilled holes for attachment hardware.
  2. Letter Color: Black.
  3. Background Color: White.
  4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
  5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
  6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
  7. Fasteners: Stainless-steel rivets or self-tapping screws.
  8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

## 2.2 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Self-Adhesive Pipe Labels: Contact-type permanent adhesive, compatible with label and with substrate.
- C. 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.

## 2.3 DUCT LABELS

- A. General Requirements for Manufactured Duct Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Self-Adhesive Duct Labels: Contact-type permanent adhesive, compatible with label and with substrate.
- C. 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.

## 2.4 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: Anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
  2. Fasteners: Brass wire-link or beaded chain.
- 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.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

### 3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

### 3.3 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. Condensate Piping:
  - a. Background Color: Blue.
  - b. Letter Color: White.
2. Refrigerant Piping:
  - a. Background Color: Green.
  - b. Letter Color: White.

### 3.4 DUCT LABEL INSTALLATION

- A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:
  1. Blue: For supply-air ducts.
  2. Green: For outside-air ducts.
  3. Yellow: For exhaust- and return-air ducts.
- 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.

### 3.5 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and 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. Refrigerant: 1-1/2 inches, round.
    - b. Gas: 1-1/2 inches, round.
  2. Valve-Tag Color:
    - a. Refrigerant: Green.
    - b. Gas: Yellow.
  3. Letter Color:

- a. Refrigerant: White.
- b. Gas: Black.

**END OF SECTION 230553**

SECTION 230593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.2 RELATED DOCUMENTS

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

1.3 SUMMARY

- A. Section Includes:
  - 1. Balancing Air Systems:
    - a. Constant-volume air systems (New and Existing).

1.4 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An entity engaged to perform TAB Work.

1.5 SUBMITTALS

- A. Certified TAB reports.

1.6 QUALITY ASSURANCE

- A. TAB Contractor Qualifications: Engage a TAB entity certified by NEBB or TABB.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by NEBB or TABB.
  2. TAB Technician: Employee of the TAB contractor and who is certified by NEBB or TABB as a TAB technician.
- B. Certify TAB field data reports and perform the following:
1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
  2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
- C. TAB Report Forms: Use standard TAB contractor's forms approved by Engineer.
- D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."
- E. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 – “Air Balancing.”
- F. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 – “System Balancing.”

## PART 2 - PRODUCTS (Not Applicable)

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums used for supply, or relief air to verify that they meet the leakage class of connected ducts as specified in Division 23 Section Metal Ducts and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
  2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- J. Examine terminal units; such as variable-air-volume boxes and verify that they are accessible, and their controls are connected and functioning.
- K. Examine operating safety interlocks and controls on HVAC equipment.
- L. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

### 3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system-readiness checks and prepare reports. Verify the following:
1. Permanent electrical-power wiring is complete.
  2. Automatic temperature-control systems are operational.
  3. Equipment and duct access doors are securely closed.
  4. Balance, smoke, and fire dampers are open.
  5. Isolating and balancing valves are open and control valves are operational.
  6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
  7. Windows and doors can be closed so indicated conditions for system operations can be met.

### 3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.

1. Comply with requirements in ASHRAE 62.1-2004, Section 7.2.2, "Air Balancing."
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
  1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
  2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

### 3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. 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 outdoor-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. Verify that air duct system is sealed as specified in Division 23 Section "Metal Ducts."

### 3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.



1. Measure total airflow.
    - a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.
  2. Measure fan static pressures as follows to determine actual static pressure:
    - a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
    - b. Measure static pressure directly at the fan outlet or through the flexible connection.
    - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
    - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
  3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
    - a. Report the cleanliness status of filters and the time static pressures are measured.
  4. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
  5. Obtain approval from engineer for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Division 23 Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
  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 mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
1. Measure airflow of submain and branch ducts.
    - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
  2. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
  3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
- C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.
1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
  2. Adjust patterns of adjustable outlets for proper distribution without drafts.

### 3.6 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
1. Manufacturer's name, model number, and serial number.
  2. Motor horsepower rating.
  3. Motor rpm.
  4. Efficiency rating.
  5. Nameplate and measured voltage, each phase.
  6. Nameplate and measured amperage, each phase.
  7. Starter thermal-protection-element rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

### 3.7 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

- A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.
1. Measure and record the operating speed, airflow, and static pressure of each fan.
  2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
  3. Check the refrigerant charge.
  4. Check the condition of filters.
  5. Check the condition of coils.
  6. Check the operation of the drain pan and condensate-drain trap.
  7. Check bearings and other lubricated parts for proper lubrication.
  8. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.
- B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:
1. New filters are installed.

2. Coils are clean, and fins combed.
  3. Drain pans are clean.
  4. Fans are clean.
  5. Bearings and other parts are properly lubricated.
  6. Deficiencies noted in the preconstruction report are corrected.
- C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.
1. Compare the indicated airflow of the renovated work to the measured fan airflows and determine the new fan speed and the face velocity of filters and coils.
  2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
  3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
  4. Balance each air outlet.

### 3.8 TOLERANCES

- A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus, or minus 10 percent.
  2. Air Outlets and Inlets: Plus, or minus 10 percent.
  3. Heating-Water Flow Rate: Plus, or minus 10 percent.

### 3.9 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

### 3.10 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
  2. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
1. Pump curves.

2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:
  - a. Indicated versus final performance.
  - b. Notable characteristics of systems.
  - c. Description of system operation sequence if it varies from the Contract Documents.
12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:
  - a. Settings for outdoor-, return-, and exhaust-air dampers.
  - b. Conditions of filters.
  - c. Cooling coil, wet- and dry-bulb conditions.
  - d. Face and bypass damper settings at coils.
  - e. Fan drive settings including settings and percentage of maximum pitch diameter.
  - f. Inlet vane settings for variable-air-volume systems.
  - g. Settings for supply-air, static-pressure controller.
  - h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

END OF SECTION 230593

## SECTION 230700

### HVAC INSULATION

#### PART 1 - GENERAL

##### 1.2 SUMMARY

- A. Section Includes:
  - 1. Miner fiber board insulation.
  - 2. Flexible elastomeric, preformed pipe insulation.
  - 3. Field-applied jackets.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

##### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. 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.

##### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

##### 1.6 COORDINATION

- A. Coordinate 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 duct Installer for duct insulation application. Before preparing ductwork shop drawings, establish and maintain clearance requirements for installation of insulation and for space required for maintenance.

## 1.7 SCHEDULING

- A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## PART 2 - PRODUCTS

### 2.1 INSULATION MATERIALS

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber 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 without factory-applied jacket.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. CertainTeed Corp.; Commercial Board.
    - b. Fibrex Insulations Inc.; FBX.
    - c. Johns Manville; 800 Series Spin-Glas.
    - d. Knauf Insulation; Insulation Board.
    - e. Manson Insulation Inc.; AK Board.
    - f. Owens Corning; Fiberglas 700 Series.
    - g. Or approved equal.
- G. Flexible Elastomeric, Preformed Pipe Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Aeroflex USA, Inc.; Aerocel.
    - b. Armacell LLC; AP Armaflex.
    - c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.
    - d. Or approved equal.

## 2.2 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. Metal Jacket:
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
    - b. ITW Insulation Systems; Aluminum and Stainless-Steel Jacketing.
    - c. RPR Products, Inc.; Insul-Mate.
    - d. Or approved equal
  - 2. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14.
    - a. Factory cut and rolled to size.
    - b. Finish and thickness are indicated in field-applied jacket schedules.
    - c. Moisture Barrier for Indoor Applications: 2.5-mil- (0.063-mm-) thick polysurlyn.
    - d. Moisture Barrier for Outdoor Applications: 2.5-mil- (0.063-mm-) thick polysurlyn.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
  - 1. Verify that systems and equipment to be insulated have been tested and are free of defects.
  - 2. Verify that surfaces to be insulated are clean and dry.
  - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

### 3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings and throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of duct or 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 ducts, 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.
- 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 duct. 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 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.

### 3.4 PENETRATIONS

- A. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. 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 (50 mm).
  - 4. Seal jacket to wall flashing with flashing sealant.
- B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

### 3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC PREFORMED PIPE INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Fittings and Elbows:
  - 1. Install mitered sections of pipe insulation.
  - 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Valves and Pipe Specialties:
  - 1. Install preformed valve covers manufactured of same material as pipe insulation when available.
  - 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
  - 3. Install insulation to flanges as specified for flange insulation application.
  - 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

### 3.6 MINERAL-FIBER INSULATION INSTALLATION

- A. 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 over compress insulation during installation.
    - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1-inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
  - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
  - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

### 3.7 FIELD-APPLIED JACKET INSTALLATION

- A. 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.

### 3.8 FINISHES

- A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- C. Do not field paint aluminum or stainless-steel jackets.

### 3.9 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
  1. Indoor, supply, return and outdoor air.
  2. Outdoor, supply, return and outdoor air.
- B. Items Not Insulated:
  1. Factory-insulated flexible ducts.
  2. Flexible connectors.
  3. Vibration-control devices.
  4. Factory-insulated access panels and doors.

### 3.10 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
  - 1. Drainage piping located in crawl spaces.
  - 2. Underground piping.
  - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

### 3.11 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed or exposed, supply-, return-, and outdoor-air duct insulation on ducts installed below the building insulation located on the bottom chord of the roof trusses shall be mineral-fiber board with thickness and density as required for an installed R value of R-5.
- B. Concealed supply-, return-, and outdoor-air duct insulation on ducts installed above the building insulation located on the bottom chord of the roof trusses shall be mineral-fiber board with thickness and density as required for an installed R value of R-8.

### 3.12 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Exposed supply-, return-, and outdoor-air duct insulation shall be mineral-fiber board with thickness and density as required for an installed R value of R-8.

### 3.13 INDOOR PIPING INSULATION SCHEDULE

- A. Refrigerant Suction, Liquid and Hot-Gas Flexible Tubing: Flexible elastomeric, 1 inch thick.

### 3.14 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

- A. Refrigerant Suction and Hot-Gas Flexible Tubing: Flexible Elastomeric, 2 inches thick.

### 3.15 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:
  - 1. Aluminum, Stucco Embossed: 0.040 inch thick.

### 3.16 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. Ducts and Plenums:

1. Aluminum, Stucco Embossed: 0.040 inch thick.

END OF SECTION 230700

## SECTION 230900

### INSTRUMENTATION AND CONTROL FOR HVAC

#### PART 1 - GENERAL

##### 1.2 RELATED DOCUMENTS

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

##### 1.3 SCOPE OF WORK

- A. Provide a native BACnet Direct Digital Control (DDC) system for the automation of building systems, hereafter referred to as the Building Automation System (BAS). The BAS contractor shall furnish all engineering, programming, material, labor, and supervision for a complete and functioning automation system.
- B. The system shall be WebCTRL, by Automated Logic Corporation. ALC WebCTRL has been approved by DGS as a proprietary item. No other manufacturers/items will be accepted. Provide the ALC WebCTRL system using the following BAS contractor:

Automated Logic / Harrisburg Branch – Ozzie Torres (717) 317-0802

- C. The above item (BACnet DDC Automatic Temperature Control System) has been approved by the Department (DGS) as a Proprietary Item. No other item will be accepted. Article 15, Paragraph 15.21, Substitution of Materials, of the Instructions to Bidders to the Construction Contract does not apply to the above item.
- D. The specification sections “General Conditions”, “Special Requirements”, and “General Requirements” form a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.
- E. Applicable General Conditions, Division 1, and any and all referenced documents for the project shall apply to the work in Division 15, including all addenda and other supplemental instructions and modifications.
- F. Mechanical equipment, including but not limited to terminal units, shall be DDC controlled with electric actuation, unless otherwise specified in the sequences of operation.

- G. The BAS shall be in full compliance with BACnet ANSI/ASHRAE Standard 135-1995. Non-BACnet compliant systems and devices (including gateways) shall not be acceptable. The BAS Contractor shall provide a BACnet router supporting BACnet over Ethernet IP. The system will be monitored/adjusted by the existing WebCTRL master system/server at Fort Indiantown Gap (FIG).
- H. A regional server shall be provided for redundancy and network management, if required by PANG. BAS Contractor shall be responsible for completely interfacing the BAS into WebCTRL and providing associated graphic and database updates, including thermo-graphic floor plans, mechanical system graphics, BACnet schedules and BACnet trends. Regional server hardware, software, and programming to be provided by the local ALC contractor. Master server database and graphics at Fort Indiantown Gap to be updated and managed by Automated Logic Automation.
- I. The facility Readiness Center (RC) shall each be provided with a dedicated Client Workstation for accessing the BAS. This applies to buildings that include a new BAS in the design. Client Workstation is not required in buildings where the regional server is located.
- J. The BAS architecture shall feature distributed control, permitting expansion through the addition of controllers without modification to the base system.

#### 1.4 WORK BY OTHERS

- A. The Mechanical Contractor shall install control dampers furnished under this section.
- B. The Mechanical Contractor shall install all devices furnished under this section for mounting in piping systems (i.e. control valves, thermal wells, flow sensors, pressure taps, etc.).
- C. The Electrical Contractor shall furnish and wire duct smoke detectors as well as the fire alarm equipment. The Mechanical Contractor shall install all duct mounted smoke detectors.
- D. The BAS shall provide all power wiring, including 120VAC circuits to BAS control panels and 24VAC power to terminal equipment controls, from a dedicated circuit breaker.
- E. The Using Agency shall provide required Ethernet IP drops, RCAS access and addressing requirements for each building.
- F. The Using Agency shall provide all required security software for the servers and client workstations. Computers shall be sent to Fort Indiantown Gap for installation of the software. Software shall be installed prior to use on the BAS.

#### 1.5 WARRANTY AND GUARANTY

- A. The BAS contractor shall guarantee all labor and material furnished for a period of one year from the date of acceptance. BAS contractor shall visit each site quarterly (during change of seasons) to verify that automation system is functioning as designed and to make any appropriate adjustments to the system without expense to the Department or Using Agency. The following provisions apply:

1. Warranty service during normal working hours
  2. Labor and material to replace defective parts or components
  3. Labor to “tune” software if a change in season produces unacceptable control behavior during the warranty period
- B. The BAS contractor shall maintain a current copy of all software and databases for the BAS, on a host computer at their office, for a period of one year from the date of acceptance. The BAS contractor shall utilize the host computer for system debugging and troubleshooting if a problem with software is reported or suspected. Any modifications to software shall be saved on the host computer in addition to each controller affected, the customer operator interface, and any customer copies.

## PART 2 - PRODUCTS

### 2.1 OPERATOR INTERFACE & SYSTEM OVERVIEW

- A. Existing master server hardware and software, currently located at Fort Indiantown Gap shall be used. Regional servers shall be provided for redundancy and network management, as required by the User Agency. Technical product specs in this paragraph refer to the regional servers. The server software is based on a server/thin-client architecture, designed around the open standards of web technology. The existing BAS server shall communicate using ASHRAE’s BACnet/IP protocol. Server shall be accessed using a web browser over the RCAS network. The BAS Contractor shall integrate the thermographic floor-plans, graphics, scheduling, events, and trends into the existing WebCTRL and associated databases. Requirements for graphics, events, trends, and schedules are specified in the applicable sections of Paragraph 2.2 Web Browser Graphical User Interface. All of the system objects, schedules, and events shall be represented as BACnet objects by the BAS Contractor.
- B. The intent of the thin-client architecture is to provide the operator(s) complete access to the BAS system via a web browser. The thin-client web browser Graphical User Interface (GUI) shall be browser and operating system agnostic, meaning it will support Microsoft Explorer (6.0 or later versions), and Windows as well as non-Window operating systems. No special software, (active-x components or fat java clients) shall be required to be installed on the PC’s used to access the BAS via a web browser.
- C. The web browser GUI shall provide a completely interactive user interface and must offer the following features as a minimum:
1. Trending
  2. Scheduling
  3. Downloading Memory to field devices
  4. Real time 'live' Graphic Programs
  5. Tree Navigation
  6. Parameter change of properties
  7. Setpoint Adjustments
  8. Alarm / Event information
  9. Configuration of operators
  10. Execution of global commands



D. Software Components

1. All software components of the BAS system software shall be installed and completed in accordance with the specification. BAS system components shall include:
  - a. Server Software, Database and Web Browser Graphical User Interface
  - b. System Configuration Utilities for future modifications to the system
  - c. Graphical Programming Tools
  - d. Direct Digital Control software
  - e. Application Software

E. BAS Server Database

1. The BAS server software shall utilize a Java Database Connectivity (JDBC) compatible database such as: MS Access, MS SQL, Oracle 8i or IBM DB2.

F. Database Open Connectivity

1. The BAS server database shall be Java Database Connectivity (JDBC) compatible, allowing real time access of data via the following standard mechanisms:
  - a. Open protocol standard like CORBA or SOAP
  - b. OLE/OPC (for Microsoft Client's/Server platform only)
  - c. Import/Export of the database from or to XML (eXtensible Mark-up Language)

G. Communication Protocol(s)

1. The native protocol for the BAS server software shall be BACnet over Ethernet DataLink as defined by ASHRAE standard SPC135. The BAS Server shall support BACnet/IP Annex J to enable communication through common routers.

H. Thin Client – Web Browser Based

1. The GUI shall be thin client or browser based and shall meet the following criteria:
  - a. Web Browser's for PC's: Only a 6.0 or later browser (Explorer) will be required as the GUI, and a valid connection to the server network. No installation of any custom software shall be required on the operator's GUI workstation/client. Connection shall be over RCAS.
  - b. Secure Socket Layers: Communication between the Web Browser GUI and BAS server shall offer encryption using 128-bit encryption technology within Secure Socket Layers (SSL). Communication protocol shall be Hyper-Text Transfer Protocol (HTTP).

## 2.2 WEB BROWSER GRAPHICAL USER INTERFACE

A. Web Browser Navigation

1. The Thin Client web browser GUI shall provide a comprehensive user interface. Using a collection of web pages, it shall be constructed to “feel” like a single application, and provide a complete and intuitive mouse/menu driven operator interface. It shall be possible to navigate through the system using a web browser to accomplish 2.02 B thru 2.02 J of this specification. The Web Browser GUI shall (as a minimum) provide a Navigation Pane for navigation, and a Action Pane for display of animated graphics, schedules, alarms/events, live graphic programs, active graphic setpoint controls, configuration menus for operator access, reports, and reporting actions for events.

B. Login

1. On launching the web browser and selecting the appropriate domain name or IP address, the operator shall be presented with a login page that will require a login name and password. Navigation in the system shall be dependent on the operator’s role privileges, and geographic area of responsibility.

C. Navigation Pane

1. The Navigation Pane shall comprise a Navigation Tree which defines a geographic hierarchy of the Using Agency’s Web-Control system. Navigation through the GUI shall be accomplished by clicking on appropriate level of a navigation tree (consisting of expandable and collapsible tree control like Microsoft’s Explorer program), and/or by selecting dynamic links to other system graphics. Both the navigation tree and action pane shall be displayed simultaneously, enabling the operator to select a specific system or equipment, and view the corresponding graphic.

D. Action Pane

1. The Action Pane shall provide several functional views for each HVAC or mechanical/electrical subsystem specified. A functional view shall be accessed by clicking on the corresponding button:
  - a. Graphics: Using animated gifs or other graphical format suitable for display in a web browser, graphics shall include aerial building/campus views, color building floor-plans, equipment drawings, active graphic setpoint controls, web content, and other valid HTML elements. The data on each graphic page shall automatically refresh at a rate defined by the operator.
  - b. Properties: Shall include graphic controls and text for the following: Locking or overriding BACnet objects, demand strategies, and any other valid data required for setup. Changes made to the properties pages shall require the operator to depress a ‘accept/cancel’ button.
  - c. Schedules: Shall be used to create, modify/edit and view schedules based on the systems geographical hierarchy (using the navigation tree) and in compliance with section 2.2.G
  - d. Events: Shall be used to view alarm event information geographically (using the navigation tree), acknowledge events, sort events by category, actions and verify reporting actions.

- e. Trends: Shall be used to display associated trend and historical data, modify colors, date range, axis and scaling
- f. Logic - Live Graphic Programs: Shall be used to display a 'live' graphic programs of the control algorithm for the mechanical/electrical system selected in the navigation tree.
- g. Other actions such as Print, Help, Command, and Logout shall be available via a drop-down window.

E. Color Graphics

- 1. The Web Browser GUI shall make extensive use of color in the graphic pane to communicate information related to setpoints and comfort. Animated .gif's or .jpg, active setpoint graphic controls shall be used to enhance usability. Graphics tools used to create Web Browser graphics shall conform to the following basic criteria:
  - a. Display Size: The GUI workstation software shall graphically display in 1024 by 768 pixels 24-bit True Color.
  - b. General Graphic: General area maps shall show locations of controlled buildings in relation to local landmarks.
  - c. Color Floor Plans: Floor plan graphics shall show heating and cooling zones throughout the buildings in a range of colors, which provide a visual display of temperature relative to their respective setpoints (see section 3.2 F below). The colors shall be updated dynamically as a zone's actual comfort condition changes.
  - d. System Components: System graphics shall show the type of system components through the use of a pictorial representation. Selected I/O points being controlled or monitored for each piece of equipment shall be displayed with the appropriate engineering units. Animation shall be used for rotation or moving mechanical components to enhance usability.
  - e. Minimum System Color Graphics: Color graphics shall be selected and displayed via a web browser for the following:
    - 1) Each piece of equipment monitored or controlled including each terminal unit
    - 2) Each building
    - 3) Each floor and zone controlled

F. Zone Setpoint Adjustments

- 1. Color floor plans displayed via a web browser shall utilize a contiguous band of colors, each corresponding to actual zone temperatures relative to the desired heating and cooling setpoints. The ideal temperature shall be shown as a green color band. Temperatures slightly warmer than ideal shall be shown in yellow, and even warmer temperature band shall be shown in orange. Temperatures slightly cooler than ideal shall be light blue, and even cooler temperatures shall be shown as dark blue. All alarm colors shall be in red.
- 2. Active Zone Graphic Setpoint Controls: Utilizing a mouse, it shall be possible to select occupied or unoccupied setpoints (corresponding to the floor plan colors) and drag the color slide bar(s) to increase or decrease heating and cooling setpoints. In addition to the slide bars, an operator may type the numeric value of the heating and

cooling setpoints. The floor plan graphic shall then change colors on a zone-by-zone basis to reflect the actual temperature in each zone relative to the changed heating or cooling setpoint.

#### G. Hierarchical Schedules

1. Utilizing the Navigation Tree displayed in the web browser GUI, an operator (with password access) shall be able to define a Normal, Holiday or Override schedule for an individual piece of equipment or room, or choose to apply a hierarchical schedule to the entire system, site or floor area. For example, Independence Day 'Holiday' for every level in the system would be created by clicking at the top of the geographic hierarchy defined in the Navigation Tree. No further operator intervention would be required and every control module in the system with would be automatically downloaded with the 'Independence Day' Holiday.
2. All schedules that affect the system/area/equipment highlighted in the Navigation Tree shall be shown in a summary schedule table and graph.
  - a. BACnet Schedules: Schedules shall comply with the BACnet standard, (Schedule Object, Calendar Object, Weekly Schedule property and Exception Schedule property) and shall allow events to be scheduled based on:
    - 1) Types of schedule shall be Normal, Holiday or Override
    - 2) A specific date,
    - 3) A range of dates,
    - 4) Any combination of Month of Year (1-12, any), Week of Month (1-5, last, any), Day of Week (M-Sun, Any)
    - 5) Wildcard (example, allow combinations like second Tuesday of every month).
  - b. Schedule Categories: The system shall allow operators to define and edit scheduling categories (different types of functions to be scheduled; for example, lighting, HVAC occupancy, etc.). The categories shall include: name, description, icon (to display in the hierarchy tree when icon option is selected) and type of value to be scheduled.
  - c. Schedule Groups: In addition to hierarchical scheduling, operators shall be able to define functional Schedule Groups, comprised of an arbitrary group of areas/rooms/equipment throughout the facility and site. For example, the operator shall be able to define an 'individual tenant' group – who may occupy different areas within a building or buildings. Schedules applied to the 'tenant group' shall automatically be downloaded to control modules affecting spaces occupied by the 'tenant group'
  - d. Intelligent Scheduling: The control system shall be intelligent enough to automatically turn on any supporting equipment needed to control the environment in an occupied space. If the operator schedules an individual room in a VAV system for occupancy, for example, the control logic shall automatically turn on the VAV air handling unit, chiller, boiler, and/or any other equipment required to maintain the specified comfort and environmental conditions within the room.
  - e. Partial Day Exceptions: Schedule events shall be able to accommodate a time range specified by the operator.

- f. Schedule Summary Graph: The schedule summary graph shall clearly show Normal versus Holiday versus Override Schedules, and the net operating schedule that results from all contributing schedules. Note: In case of priority conflict between schedules at the different geographic hierarchy, the schedule for the more detailed geographic level shall apply.
- g. Schedule Distribution: For reliability and performance, instead of maintaining a single schedule in a field device that writes over the network to notify other devices when a scheduled event occurs, field devices will only keep their part of the schedule locally. The BAS server software shall determine which nodes a hierarchical schedule applies to and will create/modify the necessary schedule objects in each field device as necessary.

## H. Events (& Alarms)

- 1. Events and alarms associated with a specific system, area, or equipment selected in the Navigation Tree, shall be displayed in the Action Pane by selecting an 'Events' view. Events, alarms, and reporting actions shall have the following capabilities:
  - a. Events View: Each event shall display an Event Category (using a different icon for each event category), date/time of occurrence, current status, event report, and a bold URL link to the associated graphic for the selected system, area or equipment. The URL link shall indicate the system location, address and other pertinent information. An operator shall easily be able to sort events, edit event templates and categories, acknowledge or force a return to normal in the Events View as specified in this section.
  - b. Event Categories: The operator shall be able to create, edit or delete event categories such as HVAC, Maintenance, or Generator. An icon shall be associated with each Event category, enabling the operator to easily sort through multiple events displayed.
  - c. BACnet Event Templates: BACnet Event template shall define different types of alarms and their associated properties. As a minimum, properties shall include a reference name, verbose description, severity of event, acknowledgement requirements, high/low limit and out of range information.
  - d. Event Areas: Event Areas enable a operator to assign specific Event Categories to specific Event Reporting Actions. For example, it shall be possible for an operator to assign all HVAC Maintenance events on the 1<sup>st</sup> floor of a building to email the technician responsible for maintenance. The Navigation Tree shall be used to setup Event Areas in the Graphic Pane.
  - e. Event Time/Date Stamp: All events shall be generated at the DDC control module level and comprise the Time/Date Stamp using the standalone control module time and date.
  - f. Event Configuration: Operators shall be able to define the type of events generated per BACnet object. A 'network' view of the Navigation Tree shall expose all BACnet objects and their respective Event Configuration. Configuration shall include assignment of event, alarm, type of Acknowledgement and notification for return to normal or fault status.
  - g. Event Summary Counter: The view of events in the Graphic Pane shall provide a numeric counter, indicating how many events are active (in alarm), require acknowledgement, and total number of events in the BAS Server database.

- h. Event Auto-Deletion: Events that are acknowledged and closed, shall be auto-deleted from the database and archived to a text file after an operator defined period.
- i. Event Reporting Actions: Event Reporting Actions specified shall be automatically launched (under certain conditions) after an event is received by the BAS server software. Operators shall be able to easily define these Reporting Actions using the Navigation Tree and Graphic Pane through the web browser GUI. Reporting Actions shall be as follows:
  - 1) Print: Alarm/Event information shall be printed to the BAS server's PC or a networked printer.
  - 2) Email: Email shall be sent via any POP3-compatible e-mail server (most Internet Service Providers use POP3). Email messages may be copied to several email accounts.
  - 3) Note: Email reporting action shall also be used to support alphanumeric paging services, where email servers support pagers.
  - 4) File Write: The ASCII File write reporting action shall enable the operator to append operator defined alarm information to any alarm through a text file. The alarm information that is written to the file shall be completely definable by the operator. The operator may enter text or attach other data point information (such as AHU discharge temperature and fan condition upon a high room temperature alarm).
  - 5) Write Property: The write property reporting action updates a property value in a hardware module.
  - 6) SNMP: The Simple Network Management Protocol (SNMP) reporting action sends an SNMP trap to a network in response to receiving an event.
  - 7) Run External Program: The Run External Program reporting action launches specified program in response to an event.
- j. Event Simulator: The web browser GUI user shall provide an Event Simulator to test assigned Reporting Actions. The operator shall have the option of using current time or scheduling a specific time to generate the Event. Utilizing the Navigation Tree and drop-down menus in the Graphic Pane, the operator shall be able to select the Event Type, Status, Notification, Priority, Message, and whether acknowledgement is required.

## I. Trends

- 1. Trends shall conform to the BACnet Trend Log Object specification. Trends shall both be displayed and user configurable through the Web Browser GUI. Trends shall comprise analog, digital or calculated points simultaneously. A trend log's properties shall be editable using the Navigation Tree and Graphic Pane.
  - a. Viewing Trends: The operator shall have the ability to view trends by using the Navigation Tree and selecting a Trends button in the Graphic Pane. The system shall allow y- and x-axis maximum ranges to be specified and shall be able to simultaneously graphically display multiple trends per graph.

- b. Local Trends: Trend data shall be collected locally by Multi-Equipment/Single Equipment general-purpose controllers, and periodically uploaded to the BAS server if historical trending is enabled for the BACnet object. Trend data, including run time hours and start time date shall be retained in non-volatile module memory. Systems that rely on a gateway/router to run trends are NOT acceptable.
- c. Resolution. Sample intervals shall be as small as one second. Each trended point will have the ability to be trended at a different trend interval. When multiple points are selected for display that have different trend intervals, the system will automatically scale the axis.
- d. Dynamic Update. Trends shall be able to dynamically update at operator-defined intervals.
- e. Zoom/Pan. It shall be possible to zoom-in on a particular section of a trend for more detailed examination and 'pan through' historical data by simply scrolling the mouse.
- f. Numeric Value Display. It shall be possible to pick any sample on a trend and have the numerical value displayed.
- g. Copy/Paste. The operator must have the ability to pan through a historical trend and copy the data viewed to the clipboard using standard keystrokes (i.e. CTRL+C, CTRL+V).

## J. Security Access

- 1. Systems that Security access from the web browser GUI to BAS server shall require a Login Name and Password. Access to different areas of the BAS system shall be defined in terms of Roles, Privileges and geographic area of responsibility as specified:
  - a. Roles: Roles shall reflect the actual roles of different types of operators. Each role shall comprise a set of 'easily understood English language' privileges.. Roles shall be defined in terms of View, Edit and Function Privileges.
    - 1) View Privileges shall comprise: Navigation, Network, and Configuration Trees, Operators, Roles and Privileges, Alarm/Event Template and Reporting Action.
    - 2) Edit Privileges shall comprise: Setpoint, Tuning and Logic, Manual Override, and Point Assignment Parameters.
    - 3) Function Privileges shall comprise: Alarm/Event Acknowledgement, Control Module Memory Download, Upload, Schedules, Schedule Groups, Manual Commands, Print, and Alarm/Event Maintenance.
  - b. Geographic Assignment of Roles: Roles shall be geographically assigned using a similar expandable/collapsible navigation tree. For example, it shall be possible to assign two HVAC Technicians with similar competencies (and the same operator defined HVAC Role) to different areas of the system.

## 2.3 GRAPHICAL PROGRAMMING

- A. The system software shall include a Graphic Programming Language (GPL) for all DDC control algorithms resident in standalone control modules. Any system that does not use a

drag and drop method of graphical icon programming as described herein is NOT acceptable. GPL is a method used to create a sequence of operations by assembling graphic microblocks that represent each of the commands or functions necessary to complete a control sequence. Microblocks represent common logical control devices used in conventional control systems, such as relays, switches, high signal selectors, etc., in addition to the more complex DDC and energy management strategies such as PID loops and optimum start. Each microblock shall be interactive and contain the programming necessary to execute the function of the device it represents.

- B. Graphic programming shall be performed while on screen and using a mouse; each microblock shall be selected from a microblock library and assembled with other microblocks necessary to complete the specified sequence. Microblocks are then interconnected on screen using graphic "wires," each forming a logical connection. Once assembled, each logical grouping of microblocks and their interconnecting wires then forms a graphic function block which may be used to control any piece of equipment with a similar point configuration and sequence of operation.
1. Graphic Sequence
    - a. The clarity of the graphic sequence must be such that the operator has the ability to verify that system programming meets the specifications, without having to learn or interpret a manufacturer's unique programming language. The graphic programming must be self-documenting and provide the operator with an understandable and exact representation of each sequence of operation.
  2. Simulation
    - a. Full simulation capability shall be provided with the graphic programming. Operator shall be able to fully simulate the constructed control sequence prior to downloading into field control modules. Simulation capabilities shall include step-by-step, accelerated time, and operator defined simulation criteria like outside weather, demand, and communication status. Multiple graphic programs shall be simulated and displayed in split screens at the same time.
  3. GPL Capabilities
    - a. The following is a minimum definition of the capabilities of the Graphic Programming software:
      - 1) Function Block (FB): Shall be a collection of points, microblocks and wires which have been connected together for the specific purpose of controlling a piece of HVAC equipment or a single mechanical system.
      - 2) Logical I/O: Input/Output points shall interface with the control modules in order to read various signals and/or values or to transmit signal or values to controlled devices.
      - 3) BACnet Points: Shall be points that comply with the BACnet structure as defined in the BIBB's Addendum B1/B2, and the BACnet standard.



- 4) Microblocks: Shall be software devices that are represented graphically and may be connected together to perform a specified sequence. A library of microblocks shall be submitted with the BAS contractors bid.
- 5) Wires: Shall be Graphical elements used to form logical connections between microblocks and between logical I/O. Different wires types shall be used depending on whether the signal they conduct is analog or digital.
- 6) Labels: Labels shall be similar to wires in that they are used to form logical connections between two points. Labels shall form a connection by reference instead of a visual connection, i.e. two points labeled 'A' on a drawing are logically connected even though there is no wire between them.
- 7) Parameter: A parameter shall be a value that may be tied to the input of a microblock.
- 8) Properties: Dialog boxes shall appear after a microblock has been inserted which has editable parameters associated with it. Default parameter dialog boxes shall contain various editable and non-editable fields and shall contain 'push buttons' for the purpose of selecting default parameter settings.
- 9) Icon: An icon shall be graphic representation of a software program. Each graphic microblock has an icon associated with it that graphically describes its function.
- 10) Menu-bar Icon: Shall be an icon that is displayed on the menu bar on the GPL screen, which represents its associated graphic microblock.
- 11) Live Graphical Programs: The Graphic Programming software must support a 'live' mode, where all input/output data, calculated data, and setpoints shall be displayed in a 'live' real-time mode. For each piece of HVAC equipment, the entire graphic program shall be displayed through the Web Browser GUI. The operator must have the ability to scroll through the entire 'live' graphic program as necessary. Piecemeal graphic programs that only show one part of HVAC equipment program at any one time are NOT acceptable. For example, when viewing an AHU live graphic program, the operator shall see the entire AHU graphic program, not just the Heating Coil control. If Live Graphical Programs are not supported, the BAS contractor shall generate a "flow control" graphic which depicts the actual program logic for the equipment. The mechanical system graphic will include a link to the flow control graphic and real-time inputs/outputs for each control block shall be mapped onto the flow control graphic.

## 2.4 Regional Server

- A. Furnish and install a Regional Server, if required by the Using Agency. Regional server shall be provided with required software and hardware for the operation, programming and engineering of the BAS. The following minimum requirements apply:
  1. Dual Processor Pentium, 2.8 GHz
  2. 1024 MB RAM
  3. 120 GB hard drive

4. 24X Read/Write CD
5. 1.44 MB 3.5-inch floppy disk drive
6. 15-inch color monitor
7. 32 MB graphics card
8. Sound card and speakers
9. Integrated Ethernet card
10. TCPIP compatible
11. Microsoft Windows XP operating system

## 2.5 Client Workstation

- A. Furnish and install a Client Workstation for the service and operation of the system. Client Workstation is not required in buildings where the regional server is located. The following minimum requirements apply:
1. Pentium operating at 2.8 GHz
  2. 512 MB RAM
  3. 40 GB hard drive
  4. 24X Read/Write CD
  5. 1.44 MB 3.5-inch floppy disk drive
  6. 15-inch color monitor
  7. 32 MB graphics card
  8. Sound card and speakers
  9. Integrated Ethernet card
  10. TCPIP compatible
  11. Microsoft Windows XP operating system

## 2.6 CONTROLLERS

- A. The Global Controller shall be a stand-alone direct digital controller providing point control and/or interface to local controllers. User interface capabilities shall include display and modification of all system control points, variables, setpoints, schedules, and software. Local access shall be accomplished through the site operator interface.
- B. Local Controllers shall be stand-alone direct digital controllers providing point control. Each local controller shall be able to have its program edited and/or modified. Pre-packaged software may not be used.
- C. A Real-Time Operating System shall be resident in ROM or PROM and shall initiate and commence operations without operator interaction. The system program shall incorporate the following features:
1. Operation and management of all external devices
  2. Editing of software
  3. System self-testing
  4. Error detection and recovery
- D. Memory shall be non-volatile EPROM, EEPROM, and/or RAM. All data stored in RAM shall be battery backed-up for a minimum of 72 hours. Each controller shall be supplied with sufficient memory to satisfy the associated software requirements.

- E. Control Points shall be analog input (AI), digital input (DI), digital output (DO), or analog output (AO), as required for equipment and devices to be controlled and/or monitored. Each controller shall be supplied with sufficient input/output capacity to satisfy the associated control point requirements.
- F. Control Loops shall reside on a single controller: the primary input associated with the operation of an output shall reside on the same controller as the output.
- G. The Communication Network shall be a peer-to-peer high-speed local area network (LAN) capable of supporting a minimum of 20% system (control point) expansion. Each controller shall be capable of sharing point information over the LAN. If a controller fails, it shall not cause any other controller on the LAN to lose communication. If the network link for the global controller fails, the local controllers shall continue to function using the last values of shared information.
- H. Real Time Clocks shall provide time of day, day of week, month, and year. The global controller shall have a real time clock accurate to within 10 seconds per day. Each local controller with a time clock shall be capable of receiving a signal from the associated global controller, over the LAN, for synchronizing clocks. Each local controller without a time clock shall receive schedule information from the associated global controller, over the LAN. Real time clocks shall allow for automatic changeover to daylight savings time.
- I. System Access shall be through a password security system. A password shall be programmed for each user or group of users, as requested by the Using Agency, for defining the level of system access.
- J. Surge Protection shall be provided for the global controller to protect the electronics from high voltage spikes and noise. Surge protection shall comply with transient suppression in accordance with IEEE standard 587 as a Category B device.
- K. Automatic Restart After A Power Failure shall be initiated upon the restoration of power, including but not limited to the following:
  - 1. Updating of all monitored functions
  - 2. Resumption of operation based on current synchronized time and status
  - 3. Implementation of special start-up strategies as programmed in software
- L. An Uninterruptible Power Supply (UPS) shall be provided for the global controller to increase protection against power loss and to condition controller power.

## 2.7 INPUT CONTROL DEVICES

- A. Current Switches shall have an internal transformer operating normally open and/or normally closed contacts through a trip point adjustment. As a minimum, current switches shall have a range of 1A to at least 120% of the full load current rating of the equipment to be monitored. Where the equipment current rating exceeds the range of the current switch, a current transformer shall be provided to “step down” the current within the range of the switch. The current transformer shall have a current ratio with an upper limit

that is at least 120% of the full load current rating of the equipment to be monitored with accuracy equal to  $\pm 5\%$  of the range. Switch contacts shall be rated for the loads to be switched.

- B. Current Transducers/Sensors shall have a built-in power supply and shall provide a signal compatible with controller inputs. As a minimum, current transducers/sensors shall have a range of 0 to at least 120% of the full load current rating of the equipment to be monitored with accuracy equal to  $\pm 3\%$  of the range. Where the equipment current rating exceeds the range of the current transducer/sensor, a current transformer shall be provided to “step down” the current within the range of the transducer/sensor. The current transformer shall have a current ratio with an upper limit that is at least 120% of the full load current rating of the equipment to be monitored with accuracy equal to  $\pm 5\%$  of the range. Current transducers/sensors for variable frequency drives shall have a polymer core and shall provide current sensing with accuracy equal to  $\pm 0.5\%$  of the range.
- C. Differential Pressure Switches shall have an internal diaphragm operating a snap-acting switch with normally open and/or normally closed contacts through a sensitivity (set-point) adjustment screw. As a minimum, differential pressure switches shall have a range covering the upper and lower limits of the media to be sensed. Switch contacts shall be rated for the loads to be switched.
- D. End Switches shall provide true mechanical operation of normally open and/or normally closed contacts. Switch contacts shall be rated for the loads to be switched.
- E. Flow Switches shall have paddle segments, accommodating 1-inch diameter and larger pipes, operating a snap-acting switch with normally open and/or normally closed contacts through a sensitivity (setpoint) adjustment screw. Switch contacts shall be rated for the loads to be switched.
- F. Flow Meters shall be insertion type with dual turbine rotors, a non-magnetic sensing mechanism, and shall provide a signal compatible with controller inputs. As a minimum, flow meters shall have a range of 0.4 to 30 feet/second with accuracy equal to  $\pm 2\%$  of the range. Flow meters shall include a full port ball valve for installation and removal, and a local display.
- G. Humidity Sensors shall have a capacitive sensing element and shall provide a signal compatible with controller inputs. As a minimum, humidity sensors shall have a range of 0 to 95% relative humidity (RH) between the upper and lower temperature limits of air to be sensed, accuracy equal to  $\pm 2\%$  over the range of 20 to 90% RH, and stability as measured by no more than 1% drift per year. The following criteria shall be used for selecting humidity sensors:
  - 1. Duct Sensors shall be used in all ductwork or for sensing outdoor air at intakes before any dampers when mounting of an outdoor sensor is not feasible.
  - 2. Outdoor Sensors shall be used when the North outdoor building exposure is available and accessible. Outdoor sensors shall be manufactured with a weather-proof enclosure.
- H. Pressure Sensors shall have a capacitive sensing element and shall provide a signal compatible with controller inputs. As a minimum, pressure sensors shall have a range of 0 to the upper limit of the media to be sensed with accuracy equal to  $\pm 1\%$  of the range. Sen-

sors for monitoring space static pressure shall be furnished with a range of -0.1 to +0.1-inches WC and shall include a minimum NEMA type 4 enclosure when mounted exposed. Sensors for monitoring water differential pressure shall be furnished with snubbers for protection against shocks and pulsations. Sensors for monitoring steam pressure shall be furnished with snubbers for protection against shocks and pulsations, and steam pigtail siphons for protection against high temperatures. Atmospheric pressure shall be sensed as required using an outdoor air static pressure sensor (reference).

- I. Pressure-Electric Switches shall have an internal diaphragm operating a snap-acting switch with normally open and/or normally closed contacts through a sensitivity (set-point) adjustment screw. As a minimum, pressure-electric switches shall have a range covering the upper and lower limits of the media to be sensed. Switch contacts shall be rated for the loads to be switched.
- J. Carbon Monoxide & Nitrogen Dioxide Transmitters shall be microprocessor-based sensor with transmitter for continuous, effective monitoring of gases, housed in a NEMA-4 enclosure. Transmitter shall provide a 4-20 mA output in proportion to the level of gas present. A 10-step LED or LCD display shall give local visual indication of the gas level in the atmosphere. Gas transmitter shall accurate to within 3%.
- K. Temperature Sensors shall have either a thermistor or an RTD sensing element and shall provide a signal compatible with controller inputs. As a minimum, temperature sensors shall have a range covering the upper and lower limits of the media to be sensed, accuracy equal to  $\pm 0.36^{\circ}\text{F}$ , and stability as measured by no more than  $0.24^{\circ}\text{F}$  drift over five years. The following criteria shall be used for selecting temperature sensors:
  - 1. Duct Averaging Sensors shall be used where air stratification may be a problem, such as in mixed air.
  - 2. Duct Probe Sensors shall be used where air temperature is consistent across ductwork, such as in supply or return air. Duct probe sensors may also be used for sensing outdoor air at intakes before any dampers when mounting of an outdoor sensor is not feasible, as approved by the Engineer. Duct probe sensors used for sensing outdoor air shall have an RTD sensing element only.
  - 3. Immersion Sensors shall be used for sensing liquid temperature in pipes. Brass thermal wells shall be furnished for installation of immersion sensors in piping. Stainless steel thermal wells shall be furnished for installation of immersion sensors in piping.
  - 4. Outdoor Sensors shall be used when the North outdoor building exposure is available and accessible. Outdoor sensors shall have an RTD sensing element only and shall be manufactured with a weatherproof enclosure.
  - 5. Space Sensors shall be used in all open areas. Space sensors shall be furnished with setpoint adjustment, push-button occupancy override, and digital display where required by the sequence of operation.
  - 6. Flush Mounted, Tamper Resistant Space Sensors shall be used in public areas such as corridors lobbies, and restrooms
  - 7. Strap-On Sensors shall be used for sensing liquid temperature in pipes where the installation of thermal wells is not practical, as approved by the Professional.

## 2.8 OUTPUT CONTROL DEVICES

- A. Relays shall be plug-in style with one or more sets of normally open and/or normally closed contacts and a snap-mount socket for panel mounting. Relays for field mounting may be a one-piece assembly. Relay contacts shall be rated for the loads to be switched.

## 2.9 SAFETY CONTROL DEVICES

- A. Freezestats shall have an extended sensing element, manual reset, and a temperature range down to at least 15°F. Freezestat contacts shall be rated for the loads to be switched.

## 2.10 LOCAL CONTROL DEVICES

- A. Electric 2-Position Thermostats are not acceptable (except as safety devices). Thermostats shall be ALC Logistat or digital RS thermostats. Over-ride button and setpoint adjustment shall be included where indicated on the points list or in the sequences of operation.

## 2.11 CONTROL DAMPERS

- A. Control dampers shall be of the multi-louver type with adjacent blades rotating in opposite directions for proportional control and in parallel directions for 2-position control unless noted otherwise. Frames shall be constructed from hat-shaped channel and blades shall be a maximum of 6-inches wide. Axles shall be 1/2-inch diameter plated steel and bearings shall be either synthetic or oil-impregnated sintered bronze. A removable 6-inch x 1/2-inch diameter control shaft shall be provided for external mounting of actuator(s). Dampers shall have a mill finish and shall be furnished in the size required for installation. Linkage may be either exposed or concealed in the frame. Where damper size exceeds the maximum available for a single section, linkage shall be provided to allow multiple sections to operate as a single damper. All dampers shall be fabricated of extruded aluminum with airfoil blades, flexible metal or extruded silicone jamb seals, and rubber blade seals.

## 2.12 CONTROL VALVES

- A. Control valves shall be 2-way or 3-way and sized for the required flow rates, as indicated on the contract drawings. Hydronic control valves shall be characterized ball or globe style. Steam valves shall be globe style. 3-way valves shall be mixing type, unless noted otherwise. Flow type for 2-way valves shall be equal percentage or modified equal percentage for water applications and modified equal percentage for steam applications. Flow type for 3-way valves shall be linear. Valves up to 2-inches in size shall have brass or bronze bodies, brass or stainless-steel trim, screwed ends, and ANSI Class 250 pressure rating. Valves 2-1/2-inches in size and larger shall have cast iron or cast carbon steel bodies, brass or stainless-steel trim, flanged ends, and ANSI Class 125 pressure rating. All valves shall be rated for operation from 40°F to 250°F. The following criteria shall be used for sizing control valves:

1. Proportional valves in water lines shall be sized for a 3 to 5 psi pressure drop across the valve.
2. 2-position valves in water lines shall be line size or sized for a pressure drop across the valve equal to 10% of system water pressure.
3. Differential pressure valves across water lines shall be sized for a pressure drop equal to system water pressure at total system water flow.
4. Proportional valves in steam lines shall be sized for a pressure drop across the valve equal to 50 to 80% of the steam supply pressure.
5. 2-position valves in steam lines shall be sized for a pressure drop across the valve equal to 10% of the steam supply pressure.

## 2.13 ACTUATORS

### A. Actuators and linkage for control dampers shall meet the following criteria:

1. Actuators shall be proportional, floating control or 2-position type as required to achieve the sequence of operation.
2. Actuators shall be spring return or non-spring return type as required to achieve the sequence of operation. Damper motors for outside air, intakes and relief shall be spring return. Normal positions for dampers with spring return actuators, determined by loss of power, are indicated on the contract drawings.
3. Actuators for single section dampers shall be sized using a minimum requirement of 5 in.-lb. torque (at the control shaft) per square foot of damper area. Actuators for multiple section dampers with a jackshaft linkage assembly shall be sized using a minimum requirement of 7 in.-lb. torque (at the control shaft) per square foot of damper area.
4. Electric Actuators shall be direct coupled type.

### B. Actuators and linkage for control valves shall meet the following criteria:

1. Actuators shall be proportional, floating control or 2-position type as required to achieve the sequence of operation.
2. Actuators shall be spring return or non-spring return type as required to achieve the sequence of operation. Steam valves for heat exchangers, and valves for coils subject to freeze conditions shall be spring return. Normal positions for valves with spring return actuators, determined by loss of power, are indicated on the contract drawings.
3. Actuator/linkage assemblies shall be capable of closing valves against a minimum unbalanced pressure equal to total system pressure.
4. Actuator/linkage assemblies for steam applications shall be designed for high temperature operation.

### C. All actuators shall be rated for operation from -22°F to 122°F ambient. Actuators that are mounted outdoors shall be provided with a weatherproof cover/enclosure.

## 2.14 CONTROL PANELS

- A. Enclosures for indoor mounting shall be NEMA Type 1 (where permissible by code), constructed of 16 or 14-gauge steel with hinged, and painted by the enclosure manufacturer, both inside and outside. Explosion-proof enclosures shall be provided where required. Enclosures for outdoor mounting shall be NEMA Type 3R, constructed of 16 or 14-gauge galvanized steel with drip shield top, seam free front, back, and sides, hinged door, and painted both inside and outside. Sub-panels (backplates) shall be 14 or 12-gauge steel painted both sides, or perforated 16 gauge galvaneal steel. All enclosures/sub-panels shall be sized for 20% spare space. Enclosures shall be provided with hardware required for Using Agency's padlock.
- B. Transformers shall provide the AC voltage required, sized for the load to be served, and fused on the secondary for not more than 125% of transformer rating.
- C. Control panels shall be provided with convenience outlet, terminal strips, wire-way and panel-mounted devices (controllers, relays, transformers, solenoids, transducers, etc.). Control panels to be assembled and wired at the panel shop.
- D. Power Supplies & transformers shall provide the AC & DC voltage required, sized for the load to be served, and fused on the secondary.

## 2.15 CONTROL WIRING AND CABLE

- A. Individual low voltage (24VAC/24VDC and lower) control wiring shall be stranded copper and a minimum of No. 18 AWG. Individual high voltage (120VAC and higher) control wiring shall be stranded copper and a minimum of No. 14 AWG. All wiring shall comply with local and national electric codes.
- B. In general, multi-conductor cable for control wiring shall be furnished as specified and/or approved by the controller and device manufacturers. Plenum cable shall be provided for wiring installed in plenum ceilings. Shielded cable shall be provided when required for proper system operation. All cable shall comply with local and national electric codes.

## PART 3 - EXECUTION

### 3.1 SUBMITTAL

- A. The BAS contractor shall provide a submittal, for review and approval by the DBC, containing the following information:
  - 1. Sequence Of Operation
  - 2. Controller Point Lists
  - 3. Material Information Sheets
  - 4. Damper/Valve Schedules
  - 5. Control Drawings
- B. Material information sheets shall include manufacturer's description and technical data for all controls with the exception of wire, tubing, conduit, and miscellaneous hardware. Specific information will be provided for the following components:



1. Operator Interface
2. Controllers
3. Input Control Devices
4. Output Control Devices
5. Safety Control Devices
6. Local Control Devices
7. Control Dampers
8. Control Valves
9. Actuators
10. Automatic Block Valves/Actuators
11. Enclosures
12. Transformers
13. Power Supplies

- C. As a minimum, control drawings shall include point-to-point wiring and control diagrams showing system configuration and device locations for equipment to be controlled. In addition, provide a riser diagram showing controllers/panels, the operator interface, and associated communication/interlock wiring.

### 3.2 DELIVERY, STORAGE, AND HANDLING

- A. No material may be ordered until submittals are approved.
- B. All material shall be delivered to the job site unless noted otherwise. The BAS contractor shall be responsible for receiving all material for controls unless arranged otherwise.
- C. All material shall be stored per the manufacturer's instructions and shall be protected from weather, dirt, dust, and other contaminants.

### 3.3 INSTALLATION

- A. No construction may begin until submittals are approved.
- B. The Using Agency shall provide an Ethernet IP drop/RCAS connection and appropriate addressing for the BAS router, regional server and client workstations.
- C. All work shall be performed in accordance with local and national electric codes.
- D. Provide the necessary scheduling, supervision, and coordination with other trades to insure a smooth installation. Provide representation at job meetings as requested.
- E. All control wiring/tubing and terminations/connections required for the BAS shall be the responsibility of the BAS contractor unless noted otherwise.
- F. In general, low voltage (24VAC/24VDC and lower) control wiring installed in exposed areas and all high voltage (120VAC and higher) control wiring shall be run in conduit. Low voltage control wiring within masonry walls or CMU shall be installed in conduit. Low voltage control wiring installed above drop ceilings or within steel-stud walls shall

be neatly fastened to building structure and cabling shall be plenum rated. All conduit/wiring and cable shall be installed in conformance with the applicable provisions of the Electrical Section. No conduit or cable shall be supported from any potentially moveable item unless it is directly associated with that item.

- G. In general, pneumatic tubing installed in open areas shall be hard drawn copper, or fire-resistant polyethylene run in conduit or Wiremold. Pneumatic tubing installed within control panels, enclosures, or troughing shall be soft drawn copper or fire-resistant polyethylene. Pneumatic tubing installed above drop ceilings and inside walls may be fire resistant polyethylene. All tubing shall be installed in a manner consistent with that required for conduit/wiring and cable, to be installed in conformance with the applicable provisions of the Electrical Section. No tubing shall be supported from any potentially moveable item unless it is directly associated with that item.
- H. All controls shall be installed in accordance with the manufacturer's recommendations unless noted otherwise.
- I. In general, space temperature and humidity sensors shall be mounted at a height of 60-inches AFF. Space temperature sensors with setpoint adjustment and/or push-button occupancy override, and space switches shall be mounted at a height of 48-inches AFF. Space static pressure sensors/references for open areas shall be mounted at 10-feet AFF or ceiling height, whichever is lower. Space static pressure sensors for areas with a drop ceiling shall be mounted above the drop ceiling with a reference through the ceiling. Outdoor air temperature and humidity sensors, and static tubes for referencing atmosphere shall be mounted at a minimum height of 12-feet above ground level, for protection against vandalism.
- J. One freezestat, with a sensing element of approximately 20-feet, shall be installed for every 20 square feet of water or steam coil.
- K. Verify sizes for all control dampers with the Mechanical Contractor before ordering this equipment.
- L. All controls mounted on equipment or ductwork shall be installed outside insulation, to prevent sweating and to facilitate removal without damaging insulation. The BAS contractor shall utilize standoff boxes or brackets for mounting controls at all locations where insulation is to be applied.
- M. Provide the Mechanical Contractor with a sketch or installation diagram showing specific port designations for all 3-way control valves.
- N. Each device installed under this section that is not mounted in a panel shall be identified by a plastic laminated tag or approved equal containing the device designation.
- O. Refer to the HVAC Equipment Section of these specifications for information regarding controls to be factory supplied and/or mounted and wired.
- P. All controllers, transformers, power supplies, transmitters, and output control devices shall be installed on a sub-panel (backplate) for mounting in an enclosure, as specified for control panels, unless approved otherwise. Controllers may be mounted external to panels if furnished with a suitable enclosure. A disconnect switch and at least one power

outlet shall be installed in each panel with 120VAC power; the disconnect switch shall remove power from all panel components except the power outlet(s). Terminal blocks shall be installed in all panels larger than 12-inches by 12-inches. Controllers/panels shall be located as indicated on the contract drawings or, where there is a conflict, as approved by the Using agency and the Professional.

- Q. Pressure Transducers shall be provided with gauges for monitoring the main air supply and the branch air signals; a common gauge may be provided for the main air supply to multiple transducers in one panel/location. The main air supply to all pressure transducers shall be filtered.
- R. Each item inside a control panel shall be designated in a neat and professional manner, and all designations shall correspond to documentation referencing the panel. The panel, 120VAC power for the panel (if required), and each item on the panel door (where applicable) shall be identified using black phenolic nameplates with white lettering. The nameplate for panel power shall list voltage (120VAC), power panel designation, and breaker number.
- S. Provide all interlock wiring between separate components of equipment as required unless noted otherwise.
- T. Provide all communication/interlock wiring between controllers/panels, as furnished or supplied by others. It shall be the responsibility of the BAS contractor to provide any hardware required that is not already specified for interface and connection to another manufacturer's controls, as required by the sequence of operation and points list.

### 3.4 SOFTWARE

- A. Existing ALC software tools shall be used for programming of all controllers and databases, including control strategies, algorithms, parameters, and setpoints. Software shall be created from the approved sequence of operation and shall utilize "block" programming techniques connecting tested control blocks to form control sequencing. All software shall reside in controller memory and shall not be dependent upon the operator interface for direct operation.
- B. Automation software shall be programmed by the BAS contractor. The customer shall be provided with copies of the software and all associated documentation necessary to interpret and edit control programming as requested.
- C. Analog outputs shall be programmed using proportional plus integral (PI) control. The integral time constant shall be adjusted as required for proper "tuning" of control loops.
- D. Setpoints, schedules, and holidays shall be entered as indicated on the contract drawings and/or as directed by the Using Agency.
- E. Provide visual and/or printed reports and histories (trends) for all control points. Reports and histories shall group points by system, controller, or point type (i.e. space temperature, fan status, etc.).

- F. Provide visual and/or printed alarm messages, when conditions apply, for all alarms described in the sequence of operation. Alarm messages shall be in plain English and shall include alarm setpoint, actual condition, date, and time.

### 3.5 GRAPHICS

- A. Graphic screens shall allow the display and manipulation of BAS information through the workstation mouse. The following graphic screens shall be provided:
  - 1. The PANG Complex Plan shall be a representation of the facilities throughout the state where the buildings to be controlled are located. The plan shall include a link for selecting the building to be controlled.
  - 2. The Building Screen shall include a digital picture or photograph of the facility, as well as a floorplan riser for each floor in the building. The Floorplan shall be a color graphic representation of the deviation of the actual space temperature from its setpoint for each zone of control. A link for each floorplan detail shall be provided.
  - 3. Floor Plans shall be representations of the plans provided on the contract drawings. Each floor plan shall include a color graphic representation of the deviation of the actual space temperature from its setpoint for each zone of control. Links to the equipment serving the space shall be provided for each zone of control.
  - 4. Equipment graphic shall include a representation of the equipment being controlled, including equipment monitoring/control points and space temperature conditions. A graphic trend of space temperature shall also be displayed on the equipment graphic. A separate diagram/representation shall be provided for each piece of equipment to be controlled. If the system does not supply “live logic graphics”, flow control graphics with real-time data updates and links to the systems graphics shall be provided as specified in Paragraph 2.
- B. Graphics shall be divided into logical partitions if the required information cannot be shown on a single screen. As applicable, graphics shall allow alteration of schedules and setpoints, display of report and history (trend) information, and selection of other screens. All point information shall be dynamic with updating at least every 5 seconds.
- C. Contract drawings shall be made available, at the BAS Contractor’s request, for generating graphic screens.

### 3.6 CHECKOUT AND STARTUP

- A. Each point of control shall be checked for proper operation. Any controllers or devices that are found to be defective shall be repaired or replaced and rechecked until proper operation is established. Once all associated control points for a particular piece of equipment have been checked-out, that piece of equipment shall be started-up under control of the BAS. This procedure shall continue until all equipment specified to be controlled has been checked-out and started-up.

- B. Provide assistance and support to the Using Agency's commissioning agent. See applicable specification sections for HVAC commissioning scope.

### 3.7 BALANCING

- A. Provide the necessary positioning of control dampers and valves for air-side and water-side balancing, as applicable. Assistance shall be provided either remotely or on-site.

### 3.8 FUNCTIONAL TESTING

- A. The BAS contractor shall provide a functional test of all controls. This shall include all control devices, dampers, valves, actuators, sequence of operations and equipment. BAS contractor shall submit sample test sheets for review and approval.

### 3.9 DEMONSTRATION

- A. Upon completion of functional testing, the BAS contractor shall provide complete written documentation of testing. BAS contractor shall then schedule demonstration of system testing to the Using Agency. The BAS Contractor shall demonstrate to the Using Agency, that the sequences of operation are in accordance with the functional specifications.
- B. If less than 5% of the retesting fails to verify the original test, the test will be considered as successful. If the error rate exceeds 5%, then the demonstration shall have failed. Upon failure of the test, the BAS contractor shall make corrective action to systems and the system shall be re-demonstrated to the Using agency. The retest shall be similar to the first demonstration, except different devices may be selected. Demonstration shall continue until the error rate is reduced to below 5%.

### 3.10 FINAL ACCEPTANCE

- A. Final acceptance shall be determined when controls have been demonstrated to Using Agency's satisfaction as provided above, and training has been provided as below.

### 3.11 FINAL DOCUMENTATION

- A. Provide the requested number of Operator & Maintenance Manuals, containing as-built copies of all information in the approved submittal along with general user information regarding system access and manipulation.

### 3.12 TRAINING

- A. Provide training on the BAS applications used for the project. Training shall utilize the Operator & Maintenance Manuals for the system. Training shall be conducted following final acceptance, both before and after the Using agency has had working experience with the system.

- B. As a minimum, training shall include the following topics:
1. System Overview
    - a. Architecture
    - b. Hardware
    - c. Operator Interface
  2. System Operation
    - a. Access
    - b. Monitoring
    - c. Scheduling/Setpoint Adjustment
    - d. Trending
    - e. Control Override
    - f. Software Reload and Backup
  3. System Troubleshooting
    - a. Hardware
    - b. Software
- C. Provide a multi-media Training CD that is fully interactive and includes training for all operator functions.

#### PART 4 – SEQUENCE OF OPERATION

##### 4.1 Energy Recovery Unit (typical of 2)

1. Run Conditions - Scheduled:

The unit shall run according to a user definable time schedule in the following modes:

  - Occupied Mode: The unit shall maintain a heating setpoint of 70°F (adj.).
  - Unoccupied Mode (night setback): The unit shall maintain a heating setpoint of 65°F (adj.).
2. Alarms shall be provided as follows:
  - Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).
3. Demand Limiting - Zone Setpoint Optimization:
  - To lower power consumption, the zone setpoints shall automatically relax when the facility power consumption exceeds definable thresholds. The amount of relaxation shall be individually configurable for each zone. The zone setpoints shall automatically return to their previous settings when the facility power consumption drops below the thresholds.
4. Zone Setpoint Adjust:
  - The occupant shall be able to adjust the zone temperature heating and cooling setpoints at the zone sensor.
5. Zone Optimal Start:
  - The unit shall use an optimal start algorithm for morning start-up. This algorithm shall minimize the unoccupied warm-up or cool-down period while still achieving comfort conditions by the start of scheduled occupied period.
6. Zone Unoccupied Override:

- A timed local override control shall allow an occupant to override the schedule and place the unit into an occupied mode for an adjustable period of time. At the expiration of this time, control of the unit shall automatically return to the schedule.
- Fan:
    - The fan shall be hardwire interlocked to run with the heating output, unless shutdown on safeties.
  - Heating:
    - The heating shall be hardwire interlocked to run with the fan output, unless shutdown on safeties. The controller shall measure the zone temperature and stage the heating to maintain its heating setpoint. To prevent short cycling, the stage shall have a user definable (adj.) minimum runtime.
  - The heating shall be enabled whenever:
    - Outside air temperature is less than 65°F (adj).
    - AND the zone temperature is below heating setpoint

Point Name	Hardware Points				Software Points						
	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
Zone Setpoint Adjust	x										x
Zone Temp	x								x		x
Zone Override			x						x		x
Heating				x					x		x
Heating Setpoint					x				x		x
Schedule								x			
Low Zone Temp										x	
<b>Totals</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>4</b>	<b>1</b>	<b>5</b>
<b>Total Hardware (4)</b>				<b>Total Software (7)</b>							

#### 4.2 Split System (typical of 2)

- Run Conditions - Scheduled: The unit shall run according to a user definable time schedule in the following modes:
  - Occupied Mode: The unit shall maintain
    - A 75°F (adj.) cooling setpoint
    - A 70°F (adj.) heating setpoint.
  - Unoccupied Mode (night setback): The unit shall maintain
    - A 85°F (adj.) cooling setpoint.
    - A 55°F (adj.) heating setpoint.
- Alarms shall be provided as follows:

- High Zone Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
- Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).

C. Fan:

1. The fan shall run anytime the unit is commanded to run, unless shutdown on safeties.

D. Cooling Stage:

2. The controller shall measure the zone temperature and stage the cooling to maintain its cooling setpoint. To prevent short cycling, the stage shall have a user definable (adj.) minimum runtime.

E. The cooling shall be enabled whenever:

- Outside air temperature is greater than 60°F (adj.).
- AND the zone temperature is above cooling setpoint.
- AND the fan is on.

F. Fan Status:

The controller shall monitor the fan status.

G. Alarms shall be provided as follows:

- Fan Failure: Commanded on, but the status is off.
- Fan in Hand: Commanded off, but the status is on.
- Fan Runtime Exceeded: Fan status runtime exceeds a user definable limit (adj.).

Point Name	Hardware Points				Software Points							Show On Graphic
	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm		
Zone Temp	x									x		x
Fan Status			x									x
Cooling Stage 1				x						x		x
Fan Start/Stop				x						x		x
Cooling Setpoint					x					x		x
Heating Setpoint					x					x		x
Schedule									x			
Compressor Runtime Exceeded											x	
Fan Failure											x	
Fan in Hand											x	



Point Name	Hardware Points				Software Points							Show On Graphic
	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm		
Fan Runtime Exceeded											x	
High Zone Temp											x	
Low Zone Temp											x	
<b>Totals</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>5</b>	<b>6</b>	<b>6</b>	

**Total Hardware (4)**
**Total Software (14)**

4.3 Exhaust Fan - On/Off (typical of 2)

A. Run Conditions - Interlocked:

The fan(s) EF --- shall be interlocked to run whenever Air Handling Unit ---- runs unless shutdown on safeties.

B. Fan:

The fan shall have a user definable (adj.) minimum runtime.

C. Fan Status:

The controller shall monitor the fan status.

D. Alarms shall be provided as follows:

- Fan Failure: Commanded on, but the status is off.
- Fan in Hand: Commanded off, but the status is on.
- Fan Runtime Exceeded: Fan status runtime exceeds a user definable limit (adj.).

Point Name	Hardware Points				Software Points							Show On Graphic
	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm		
Fan Status			x							x		x
Fan Start/Stop				x						x		x
Fan Failure											x	
Fan in Hand											x	
Fan Runtime Exceeded											x	
<b>Totals</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>3</b>	<b>2</b>	

**Total Hardware (2)**
**Total Software (5)**

4.4 Hot Water Heater (typical of 1)

A. The BAS system shall monitor the hot water heater outlet temperature.

Point Name	Hardware Points				Software Points						
	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
Outlet Temperature	x								x	x	x
<b>Totals</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>
<b>Total Hardware (1)</b>					<b>Total Software (2)</b>						

#### 4.5 METERING

- A. The BAS contractor shall be responsible for furnishing and installing the electric meter. The BAS contractor shall be responsible for wiring the meter signal to the BAS system.
- B. The BAS contractor shall be responsible for furnishing the water meter to the Plumbing contractor for field installation. The BAS contractor shall be responsible for wiring the meter signal to the BAS system.

Point Name	Hardware Points				Software Points					
	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	Show On Graphic
Electric Meter (Modbus)					x			x		x
Water Meter			x					x		x
<b>Totals</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>2</b>

#### 4.6 LP Gas Tank Monitor (typical of 1)

- A. The BAS system shall monitor the gas tank level.

Point Name	Hardware Points				Software Points						
	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
Tank Alarm 1			x						x	x	x
Tank Alarm 2			x						x	x	x
Tank Level CH1			x						x	x	x
Tank Level CH2			x						x	x	x
<b>Totals</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>4</b>	<b>4</b>
<b>Total Hardware (4)</b>					<b>Total Software (8)</b>						

END OF SECTION 230900

SECTION 233113

METAL DUCTS

PART 1 - GENERAL

1.2 RELATED DOCUMENTS

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

1.3 SUMMARY

A. Section Includes:

- 1. Rectangular ducts and fittings.
- 2. Round ducts and fittings.
- 3. Sheet metal materials.
- 4. Sealants and gaskets.
- 5. Hangers and supports.

B. Related Sections:

- 1. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7.
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

## 1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Submittals: Steel Certificates: For each type of product indicated.
  - 1. Exhaust Duct.
- C. Shop Drawings:
  - 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
  - 2. Factory- and shop-fabricated ducts and fittings.
  - 3. Fittings.
  - 4. Reinforcement and spacing.
  - 5. Seam and joint construction.
  - 6. Equipment installation based on equipment being used on Project.
  - 7. Hangers and supports, including methods for duct and building attachment and vibration isolation.
  - 8. Testing, Balancing and Adjusting Reports.
  - 9. Steel Certifications.
- D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

## PART 2 - PRODUCTS

### 2.1 RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable

sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

## 2.2 ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Lindab Inc.
    - b. McGill AirFlow LLC.
    - c. SEMCO Incorporated.
    - d. Sheet Metal Connectors, Inc.
    - e. Spiral Manufacturing Co., Inc.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

## 2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
  - 1. Galvanized Coating Designation: G60 or G90.

2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- D. 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.
- E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

#### 2.4 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. 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.
  3. Sealant: Modified styrene acrylic.
  4. Water resistant.
  5. Mold and mildew resistant.
  6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
  7. Service: Indoor and outdoor.
  8. Service Temperature: Minus 40 to plus 200 deg F.
  9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
  10. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  11. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. 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, 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.

D. 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.
6. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg 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.

## 2.5 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," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "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.
  - I. 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.
  - J. 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.
  - K. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
  - L. 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.

### PART 3 - EXECUTION

#### 3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.



- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

### 3.2 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
  - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  - 2. Outdoor, Supply-Air Ducts: Seal Class A.
  - 3. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
  - 4. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
  - 5. Unconditioned Space, Exhaust Ducts: Seal Class C.
  - 6. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
  - 7. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
  - 8. Conditioned Space, Exhaust Ducts: Seal Class B.

### 3.3 ADDITIONAL INSTALLATION REQUIREMENTS FOR COMMERCIAL KITCHEN HOOD EXHAUST DUCT

- A. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease and sloped a minimum of 2 percent to drain grease back to the hood.
- B. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 20 feet in horizontal ducts, and at every floor for vertical ducts, or as indicated on Drawings. Locate access panel on top or sides of duct a minimum of 1-1/2 inches from bottom of duct.
- C. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

### 3.4 DUCT SCHEDULE

- A. Supply Ducts:

1. Ducts Connected to Make-Up Air Units:
  - a. Pressure Class: Positive 2-inch wg.
  - b. Minimum SMACNA Seal Class: A.
  - c. SMACNA Leakage Class for Rectangular: 12.

B. Exhaust Ducts:

1. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.
  - a. Exposed to View: Type 304, stainless-steel sheet, No. 4 finish.
  - b. Concealed: Carbon Steel Sheet.
  - c. Welded seams and joints.
  - d. Pressure Class: Positive or negative 2-inch wg.
  - e. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
  - f. SMACNA Leakage Class: 3.

### 3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "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 thick.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. 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 interval 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.

### 3.6 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 ADDITIONAL INSTALLATION REQUIREMENTS FOR COMMERCIAL KITCHEN HOOD EXHAUST DUCT

- A. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease and sloped a minimum of 2 percent to drain grease back to the hood.

3.8 DUCT CLEANING

- A. Clean new duct system before testing, adjusting, and balancing.

3.9 START UP

- A. Air Balance: Contractor shall test and adjust fans to Toilet/Shower room exhaust fans for proper rotation and working order. Balance and Adjust outside air handler supply ductwork for required CFM to each supply diffuser and grille. Provide a balance report upon completion.

3.10 DUCT SCHEDULE

A. Supply Ducts:

1. Ducts Connected to Fan Coil Units, Heat Pumps, and Terminal Units:

- a. Pressure Class: Positive and Negative: 2-inch wg .
- b. Minimum SMACNA Seal Class: A.
- c. SMACNA Leakage Class for Rectangular: 12.
- d. SMACNA Leakage Class for Round and Flat Oval: 12.

B. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

- a. Pressure Class: Negative 2-inch wg .
- b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
- c. SMACNA Leakage Class for Rectangular: 12.
- d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Equipment Not Listed Above:

- a. Pressure Class: Positive or negative 2-inch wg.
- b. Minimum SMACNA Seal Class: A.
- c. SMACNA Leakage Class for Rectangular: 12.
- d. SMACNA Leakage Class for Round and Flat Oval: 12.

3. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.

- a. Exposed to View: Type 304, stainless-steel sheet, No. 4 finish.
- b. Concealed: Carbon Steel Sheet.
- c. Welded seams and joints.

- d. Pressure Class: Positive or negative 2-inch wg.
- e. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
- f. SMACNA Leakage Class: 3.

C. Elbow Configuration:

- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
  - a. Velocity 1000 fpm or Lower:
    - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
    - 2) Mitered Type RE 4 without vanes.
  - b. Velocity 1000 to 1500 fpm:
    - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
    - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
    - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
- 2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
  - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
  - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
  - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
- 3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
  - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
    - 1) Velocity 1000 fpm: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
    - 2) Radius-to Diameter Ratio: 1.5.
  - b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.

D. Branch Configuration:

- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

- a. Rectangular Main to Rectangular Branch: 45-degree entry.
  - b. Rectangular Main to Round Branch: Spin in.
2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
- a. Velocity 1000 fpm or Lower: 90-degree tap.

END OF SECTION 233113

SECTION 233300

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.2 RELATED DOCUMENTS

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

1.3 SUMMARY

- A. Section Includes:
  - 1. Manual volume dampers.
  - 2. Control dampers.
  - 3. Smoke dampers.
  - 4. Flange connectors.
  - 5. Turning vanes.
  - 6. Duct-mounted access doors.
  - 7. Flexible connectors.
  - 8. Flexible ducts.
  - 9. Duct accessory hardware.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
  - 1. Product Data for Prerequisite EQ 1: Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."
  - 2. Product Data for Prerequisite EA 2: Documentation indicating that duct insulation R-values comply with tables in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air Conditioning."
- C. 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 and smoke-damper installations, including sleeves; and duct-mounted access doors.
  - e. Wiring Diagrams: For power, signal, and control wiring.
- D. Operation and maintenance data.

## 1.5 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.

## 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 or G90.
  2. Exposed-Surface Finish: Mill phosphatized.
- C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and finish for exposed ducts.
- D. Aluminum Sheets: Comply with ASTM B 209, 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, 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 minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

## 2.2 MANUAL VOLUME DAMPERS

### A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Air Balance Inc.; a division of Mestek, Inc.
  - b. Anemostat, Inc.
  - c. American Warming and Ventilating; a division of Mestek, Inc.
  - d. Flexmaster U.S.A., Inc.
  - e. McGill AirFlow LLC.
  - f. METALAIRE, Inc.
  - g. Nailor Industries Inc.
  - h. Pottorff; a division of PCI Industries, Inc.
  - i. Ruskin Company.
  - j. Trox USA Inc.
  - k. Vent Products Company, Inc.
2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:
  - a. Hat-shaped, galvanized steel channels, 0.064-inch minimum thickness.
  - b. Mitered and welded corners.
  - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:
  - a. Multiple or single blade.
  - b. Parallel- or opposed-blade design.
  - c. Stiffen damper blades for stability.
  - d. Galvanized-steel, 0.064 inch thick.
6. Blade Axles: Galvanized steel.
7. Bearings:
  - a. Oil-impregnated bronze or Stainless-steel sleeve.
  - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Tie Bars and Brackets: Galvanized steel.

### B. Standard, Aluminum, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Air Balance Inc.; a division of Mestek, Inc.
  - b. Anemostat, Inc.



- c. American Warming and Ventilating; a division of Mestek, Inc.
  - d. Flexmaster U.S.A., Inc.
  - e. McGill AirFlow LLC.
  - f. METALAIRE, Inc.
  - g. Nailor Industries Inc.
  - h. Pottorff; a division of PCI Industries, Inc.
  - i. Ruskin Company.
  - j. Trox USA Inc.
  - k. Vent Products Company, Inc.
- 2. Standard leakage rating, with linkage outside airstream.
  - 3. Suitable for horizontal or vertical applications.
  - 4. Frames: Hat-shaped, 0.10-inch- 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- thick aluminum sheet.
    - e. Extruded-Aluminum Blades: 0.050-inch- thick extruded aluminum.
  - 6. Blade Axles: Galvanized steel
  - 7. Bearings:
    - a. Oil-impregnated bronze or Stainless-steel sleeve.
    - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
  - 8. Tie Bars and Brackets: Aluminum.
- C. Jackshaft:
- 1. Size: 1-inch diameter.
  - 2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
  - 3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.
- D. Damper Hardware:
- 1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
  - 2. Include center hole to suit damper operating-rod size.
  - 3. Include elevated platform for insulated duct mounting.

## 2.3 FLANGE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
  2. Nexus PDQ; Division of Shilco Holdings Inc.
  3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- C. Material: Galvanized steel.
- D. Gage and Shape: Match connecting ductwork.

## 2.4 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.
  5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."
- E. Vane Construction: Single wall.
- F. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

## 2.5 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. American Warming and Ventilating; a division of Mestek, Inc.
  2. Cesco Products; a division of Mestek, Inc.
  3. Ductmate Industries, Inc.
  4. Flexmaster U.S.A., Inc.

5. Greenheck Fan Corporation.
6. McGill AirFlow LLC.
7. Nailor Industries Inc.
8. Pottorff; a division of PCI Industries, Inc.
9. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2 "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."

1. Door:
  - a. Double wall, rectangular.
  - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
  - c. Vision panel.
  - d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
  - e. Fabricate doors airtight and suitable for duct pressure class.
2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:
  - a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
  - b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
  - c. Access Doors up to 24 by 48 Inches (Three hinges and two compression latches).

## 2.6 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.
  4. Ward Industries, Inc.; a division of Hart & Cooley, 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 wide attached to 2 strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
  1. Minimum Weight: 26 oz./sq. yd.
  2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
  3. Service Temperature: Minus 40 to plus 200 deg F Minus 40 to plus.

- 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.
  2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
  3. Service Temperature: Minus 50 to plus 250 deg F.
- G. 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 movement at start and stop.

## 2.7 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Flexmaster U.S.A., Inc.
  2. McGill AirFlow LLC.
  3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene or aluminized vapor-barrier film.
1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
  2. Maximum Air Velocity: 4000 fpm.
  3. Temperature Range: Minus 10 to plus 160 deg F.
  4. Insulation R-value: Comply with ASHRAE/IESNA 90.1.
- C. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene or aluminized vapor-barrier film.
1. Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.
  2. Maximum Air Velocity: 4000 fpm.
  3. Temperature Range: Minus 20 to plus 175 deg F.
  4. Insulation R-Value: Comply with ASHRAE/IESNA 90.1.
- D. Insulated, Flexible Duct: UL 181, Class 0, interlocking spiral of aluminum foil; fibrous-glass insulation; polyethylene or aluminized vapor-barrier film.

1. Pressure Rating: 8-inch wg positive or negative.
2. Maximum Air Velocity: 5000 fpm.
3. Temperature Range: Minus 20 to plus 250 deg F.
4. Insulation R-value: Comply with ASHRAE/IESNA 90.1

E. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action or Nylon strap in sizes 3 through 18 inches, to suit duct size.

## 2.8 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install control dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
  1. Install steel volume dampers in steel ducts.
  2. Install aluminum volume dampers in aluminum ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire and smoke dampers according to UL listing.
- H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
  2. At outdoor-air intakes and mixed-air plenums.
  3. At drain pans and seals.
  4. Downstream from manual volume dampers, control dampers, and equipment.
  5. 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.
  6. At each change in direction and at maximum 50-foot spacing.
  7. Upstream and downstream from turning vanes.
  8. Control devices requiring inspection.
  9. Elsewhere as indicated.
- I. Install access doors with swing against duct static pressure.
- J. Access Door Sizes:
1. One-Hand or Inspection Access: 8 by 5 inches.
  2. Two-Hand Access: 12 by 6 inches.
  3. Head and Hand Access: 18 by 10 inches.
- K. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- L. Install flexible connectors to connect ducts to equipment.
- M. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- N. Connect terminal units to supply ducts directly or with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.
- O. Connect diffusers or to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.
- P. Connect flexible ducts to metal ducts with adhesive or draw bands.
- Q. Install duct test holes where required for testing and balancing purposes.
- R. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

### 3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
1. Operate dampers to verify full range of movement.
  2. Inspect locations of access doors and verify that purpose of access door can be performed.

3. Operate fire 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.

END OF SECTION 233300

SECTION 233423

HVAC POWER VENTILATORS

PART 1 - GENERAL

1.2 RELATED DOCUMENTS

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

1.3 SUMMARY

- A. Section Includes:

- 1. Direct Drive Power Blower. (EF-1)

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Wiring Diagrams: For power, signal, and control wiring.
  - 3. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
- C. Operation and maintenance data.
- D. Steel Certifications.

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. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

## PART 2 - PRODUCTS

### 2.1 DIRECT DRIVE POWER BLOWER

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Acme Engineering & Manufacturing Corporation.
  - 2. Ventaire
  - 3. Broan-NuTone LLC; NuTone Inc.
  - 4. Carnes Company.
  - 5. Hartzell Fan Incorporated.
  - 6. JencoFan.
  - 7. Loren Cook Company.
  - 8. PennBarry.
  - 9. Or approved equal.
  
- B. Housing:
  - 1. Side Wall Discharge Units: Provide cast-aluminum housing
  
- C. Fan Wheels:
  - 1. Aluminum wheel with radial blades.
  
- D. Accessories:
  - 1. Disconnect Switch: Non-fusible type, with thermal-overload protection mounted inside or outside fan housing per schedule, factory wired through an internal aluminum conduit.
  - 2. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
  - 3. Dampers:
    - a. Spring loaded, butterfly, back draft dampers with galvanized steel housing including gasket(s) mounted in duct; factory set to close when fan stops
  - 4. Stationary Exhaust Louver: Basis of design Greenheck Model ESD-435, 24" x 24" or approved equal.
  - 5. Motor Operated Hose Reel: Basis of Design Ventaire Model TMHR80XL, 120V 1Phase or approved equal.
  - 6. Hose: Basis of Design-Ventaire Model HTN-835 High Temperature Exhaust Extraction Hose, 8-inch diameter, 35 feet long or approved equal.
  
- E. Capacities and Characteristics: See Drawing Schedule for Capacities and Characteristics

### 2.2 MOTORS

- A. 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 26 Sections.
- B. Enclosure Type: Totally enclosed, fan cooled.

### 2.3 SOURCE QUALITY CONTROL

- A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
- B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Secure roof-mounted fans to roof curbs with cadmium-plated hardware.
- B. Ceiling Units: Suspend units from structure; use steel wire or metal straps.
- C. Support suspended units from structure using threaded steel rods and elastomeric hangers having a static deflection of 1 inch.
- D. Install units with clearances for service and maintenance.
- E. Label units 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 power ventilators to allow service and maintenance.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

### 3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.

- 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

- B. Tests and Inspections:

- 1. Verify that shipping, blocking, and bracing are removed.
- 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
- 3. Verify that cleaning and adjusting are complete.
- 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
- 5. Adjust belt tension.
- 6. Adjust damper linkages for proper damper operation.
- 7. Verify lubrication for bearings and other moving parts.
- 8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
- 9. Remove and replace malfunctioning units and retest as specified above.

- C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- D. Prepare test and inspection reports.

### 3.4 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Replace fan and motor pulleys as required to achieve design airflow.
- D. Lubricate bearings.

END OF SECTION 233423

## SECTION 233713

### DIFFUSERS, AND GRILLES

#### PART 1 - GENERAL

##### 1.2 RELATED DOCUMENTS

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

##### 1.3 SUMMARY

- A. Section Includes:
  - 1. Drum Louver (Duct Mounted Diffuser).
  - 2. Fixed face Grilles.
- 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 dampers and volume-control dampers not integral to diffusers, registers, and grilles.

##### 1.4 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.

#### PART 2 - PRODUCTS

##### 2.1 DUCT DIFFUSERS

- A. Drum Louver (Duct Mounted Diffuser):

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - a. Air Research Diffuser Products, Inc.
  - b. Anemostat Inc.
  - c. Carnes.
  - d. Hart & Cooley Inc.
  - e. Krueger.
  - f. METALAIRE, Inc.
  - g. Nailor Industries Inc.
  - h. Price Industries.
  - i. Titus.
  - j. Tuttle & Bailey.
  - k. Or Approved Equal.
  
2. Airflow Principle: Extended distance for high airflow rates.
3. Material: Aluminum, heavy gage extruded.
4. Finish: Natural anodized.
5. Border: 1-1/4-inch width with countersunk screw holes.
6. Gasket between drum and border.
7. Body: Drum shaped; adjustable vertically.
8. Blades: Individually adjustable horizontally.
9. Mounting: Surface to duct, countersunk screws.
10. Inlet Width: As shown on drawings.
11. Inlet Length: As shown on drawings.
12. Accessories:
  - a. Opposed-blade volume control aluminum damper.
  - b. Duct-mounting collars with countersunk screw holes.
  - c. Pole Operator for vertical adjustment.
  - d. Factory applied frame gasket.

## 2.2 DUCT MOUNTED GRILLES

### A. Fixed Blade Grille:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - a. Carnes.
  - b. Dayus Register & Grille Inc.
  - c. Anemostat, Inc.
  - d. Hart & Cooley Inc.
  - e. Krueger.
  - f. Nailor Industries Inc.
  - g. Tuttle & Bailey.
  - h. Or Approved Equal.
  
2. Material: Aluminum.
3. Finish: Natural anodized.

4. Blade Arrangement: Horizontal, Long, 3/4-inch spacing, 0° deflection.
5. Frame: 1-1/4 inches wide.
6. Mounting: Surface to duct, countersunk screw
7. Accessories:
  - a. Opposed-blade volume control aluminum damper.
  - b. Factory applied frame gasket.

### 2.3 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

## PART 3 - EXECUTION

### 3.1 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.

### 3.2 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

SECTION 237200

AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

PART 1 - GENERAL

1.2 RELATED DOCUMENTS

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

1.3 SUMMARY

- A. Section Includes:
  - 1. Packaged energy recovery units.
    - a. ERV-1,2.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. 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.
- C. Field quality-control reports.
- D. 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. ARI Compliance:
  - 1. Capacity ratings for air-to-air energy recovery equipment shall comply with ARI 1060, "Performance Rating of Air-to-Air Heat Exchangers for Energy Recovery Ventilation Equipment."
  - 2. Capacity ratings for air coils shall comply with ARI 410, "Forced-Circulation Air-Cooling and Air-Heating Coils."
- C. NRCA Compliance: Roof curbs for roof-mounted equipment shall be constructed according to recommendations of NRCA.
- D. UL Compliance:
  - 1. Packaged heat recovery ventilators shall comply with requirements in UL 1812, "Ducted Heat Recovery Ventilators"; or UL 1815, "Non-ducted Heat Recovery Ventilators."
  - 2. Electric coils shall comply with requirements in UL 1995, "Heating and Cooling Equipment."

## 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 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: One year.
  - 2. Warranty Period for Energy Recovery Wheels: Five years.
  - 3. Warranty Period for Stainless Steel Heat Exchangers: Ten years.



## PART 2 - PRODUCTS

### 2.1 PACKAGED ENERGY RECOVERY UNITS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Greenheck
  2. Advanced Thermal Technologies.
  3. American Energy Exchange, Inc.
  4. Applied Air; Mestek Technology, Inc.
  5. Carnes.
  6. Des Champs Technologies.
  7. Engineered Air.
  8. Fairchild Industrial Products Company.
  9. Gaylord Industries, Inc.
  10. Loren Cook Company.
  11. Mitsubishi Electric & Electronics USA, Inc.; HVAC Advanced Products Division.
  12. RenewAire LLC.
  13. SEMCO Incorporated.
  14. Trane; American Standard Companies, Inc.
  15. Venmar CES Inc.
  16. Wing, L. J.; Mestek Technology, Inc.
  17. Or Approved Equal.
- 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 thick thermal insulation, knockouts for electrical and piping connections, exterior drain connection, and lifting lugs.
1. Inlet: Weatherproof hood, with damper for exhaust and supply.
    - a. Exhaust: Motor-operated low leakage damper.
    - b. Supply: Motor-operated low leakage damper.
- C. Heat Recovery Device: Heat-pipe heat exchanger.
- D. Supply and Exhaust Fans: Forward-curved, centrifugal fans with neoprene or spring isolators and insulated flexible duct connections.
1. Motor and Drive: Belt driven with adjustable sheaves, motor mounted on adjustable base.
  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 static deflection.

E. Disposable Panel Filters:

1. Comply with NFPA 90A.
2. 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.
3. Factory-fabricated, viscous-coated, flat-panel type.
4. Thickness: 2 inches.
5. Minimum Merv: 8, according to ASHRAE 52.2.
6. Media: Interlaced glass fibers sprayed with nonflammable adhesive and antimicrobial agent.
7. Frame: Galvanized steel with metal grid on outlet side, steel rod grid on inlet side, hinged, and with pull and retaining handles.

F. Indirect-Fired Gas Furnace:

1. Description: Factory assembled, piped, and wired; complying with NFPA 54, "National Fuel Gas Code," and ANSI Z21.47, "Gas-Fired Central Furnaces."
  - a. AGA Approval: Furnace shall bear label of AGA.
2. Burners: Aluminized steel with stainless-steel inserts.
  - a. Ignition: Electronically controlled electric spark with flame sensor.
3. Heat-Exchanger Drain Pan: Stainless steel.
4. Power Vent: Integral, motorized centrifugal fan interlocked with gas valve.
5. Gas Control Valve: Electronic modulating.
6. Gas Train: Single-body, regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff.
7. Access: Fabricate section to allow removal and replacement of furnace and to allow in-place access for service.

G. 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 fused disconnect switches.

H. Accessories:

1. Intake weather hood with 2-inch thick filters.
2. Exhaust weather hood with bird screen and integral backdraft damper.
3. Convenience Outlet: Factory mounted duplex, 120-V, ground-fault-interrupter outlet with minimum 15-A overcurrent protection. Include factory mounted transformer if required. Outlet shall be energized even if the unit main disconnect is open.
4. Low-Leakage, Isolation Dampers: Double-skin, airfoil-blade, galvanized steel dampers with compressible jamb seals and extruded-vinyl blade edge seals, in parallel-blade

arrangement with steel operating rods rotating in stainless-steel sleeve bearings mounted in a single galvanized-steel frame, with operating rods connected with a common linkage, and electric damper operator factory wired. Leakage rate shall not exceed 9 cfm/sq. ft. at 4-inch wg.

5. Duct flanges.
6. Rubber-in-shear isolators for ceiling-mounted units.
7. Hinged access doors with quarter-turn latches.
8. Unoccupied Recirculation Damper.

## 2.2 CAPACITIES AND CHARACTERISTICS

- A. See Energy Recovery Ventilator Schedule on Drawing H.2.1 Schedules & Details.

## PART 3 - EXECUTION

### 3.1 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.

### 3.2 INSTALLATION

- A. Install gas-fired furnaces according to NFPA 54, "National Fuel Gas Code."
- B. Unit Support: Install unit level on new concrete pad by HVAC contractor. Coordinate wall penetrations and flashing with wall construction. Secure air-to-air energy recovery equipment to structural support with anchor bolts.
- C. Install units with clearances for service and maintenance.
- D. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.
- E. Pipe drains from units and drain pans to adjacent grade; use ASTM B 88, Type L (ASTM B 88M, Type B), drawn-temper copper water tubing with soldered joints, same size as condensate drain connection.

### 3.3 CONNECTIONS

- A. Connect piping to units mounted on vibration isolators with flexible connectors.
- B. Gas Piping: Comply with requirements in Division 22 Section "Facility Liquefied Petroleum Natural Gas Piping." Connect gas piping with properly sized regulator and flexible connector after shutoff valve and union (provided and installed by Plumbing contractor, see HVAC and Plumbing Drawings) and with sufficient clearance for burner removal and service. Make connection with AGA-approved flexible connectors.
- C. Comply with requirements for ductwork specified in Division 23 Section "Metal Ducts."
- D. Electrical Connections: Comply with applicable requirements in Division 26 Sections.
  - 1. Install electrical devices furnished with units but not factory mounted.

### 3.4 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.

### 3.5 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain air-to-air energy recovery units.

END OF SECTION 237200

## SECTION 238120

### DUCTLESS FAN COIL SYSTEMS

#### Part 1 GENERAL

##### 1.2 System Description

- A. The heat pump air conditioning system shall be the basis of design models on the drawings or approved equal.
- B. The heat pump system shall consist of an outdoor unit, multiple indoor units

##### 1.3 Quality Assurance

- A. All wiring shall be in accordance with the National Electrical Code (N.E.C.).
- B. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
- C. A full charge of R-410A for the condensing unit only shall be provided in the condensing unit. Additional refrigerant is required based on diameters and lengths of system liquid refrigerant lines.

#### Part 2 PRODUCTS

##### 2.1 WARRANTY

###### A. LIMITED WARRANTY:

- 1. If within Five (5) years after initial installation of the product, any compressor in the Product shall prove to be defective in material or workmanship, the manufacturer will replace the defective compressor.
- 2. If within One (1) year after initial installation of the Product, the functional parts of the Product shall prove to be defective in material or workmanship the manufacturer will repair or replace the defective part.

##### 2.2 HEAT PUMP OUTDOOR UNIT (CU-X)

###### A. General:

- 1. The outdoor unit shall have a powder coated finish. The outdoor unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.

2. The sum of connected capacity of all indoor air handlers shall range from 50% to 130% of outdoor rated capacity.
  3. The heat pump system compressors shall be hermetically sealed, inverter driven, DC scroll type. No fixed capacity compressors shall be present in the refrigerant system.
  4. All refrigerant lines shall be insulated.
  5. The heat pump outdoor unit shall have an accumulator.
  6. The heat pump outdoor unit shall have a high-pressure safety switch, over-current protection, thermal fan protection, low pressure protection, compressor overcurrent protection, fan motor voltage protection, current transformer(s), crank case heaters, and intelligent logic to ensure proper operation within unit design limitations and operational parameters.
  7. Provide wind baffles for low ambient cooling.
  8. The heat pump outdoor unit shall have a shell and tube type sub-cooler to sub cool liquid refrigerant further to increase capacity and performance with long pipe lengths and to decrease refrigerant sounds at indoor equipment.
  9. The chassis shall be fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel.
  10. All fan motors shall have inherent protection, thermal protection, and have permanently lubricated bearings, and be completely variable speed.
  11. All fans shall be provided with a raised guard to prevent contact with moving parts.
  12. Refrigerant flow from the outdoor unit shall be controlled by means of capacity modulation capable scroll compressor.
  13. Crankcase heaters shall be factory mounted on the compressor.
  14. The outdoor unit compressor shall have a variable modulation technology to modulate capacity.
  15. The compressor will be equipped with an internal thermal overload.
  16. The compressor shall be mounted to avoid the transmission of vibration.
  17. The outdoor unit electrical power shall be 230 volts, 1 phase, 60 hertz.
- B. ELECTRONIC EXPANSION VALVE KITS (MULTI ZONE) FOR HEAT PUMP OUTDOOR UNITS**
1. The Kit shall allow a liquid and suction pipe from the condenser to connect and meter refrigerant to 2 wall units. The units shall be equipped with a circuit board that interfaces to the Control systems and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish. The kit shall be completely factory assembled, piped

and wired. Each unit shall be run tested at the factory. This unit shall be mounted indoors.

2. An integral condensate pan and drain shall be provided on the fan coil units. Drain termination is required upon installation with an appropriate termination.

### 2.3 WALL MOUNTED INDOOR UNIT (FC-X)

#### A. General:

1. The wall-mounted indoor unit section shall have a slim silhouette.
2. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, control circuit board and fan motor.
3. The casing shall have a gloss white finish, HIPS chassis certified to UL94 V0.
4. There shall be a separate galvanized steel mounting plate which secures the unit firmly to the wall.
5. The indoor fan assembly shall be a cross-flow fan direct driven by a single motor.
6. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
7. A manual adjustable guide vane shall be provided with the ability to change the airflow from side to side (left to right).
8. A motorized air sweep louver shall provide an automatic change in airflow by directing the air up and down to provide uniform air distribution.
9. Return air shall be filtered by means of an easily removable, washable filter.
10. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.
11. The tubing shall have inner grooves for high efficiency heat exchange.
12. All tube joints shall be brazed with phos-copper or silver alloy.
13. The coils shall be pressure tested at the factory.
14. A condensate pan and drain shall be provided under the coil.
15. The coil fins are coated with hydrophilic paints.
16. Both refrigerant lines to the wall-mounted indoor unit shall be insulated.
17. The unit electrical power shall be provided from the connected condensing unit.

## 2.4 Controls:

- A. The DVM Controls Network Solution shall be capable of supporting remote controllers, schedule timers, system controllers, centralized controllers, an integrated web based interface, graphical user workstation, and system integration to Building Management Systems.
- B. The heat pumps shall be furnished with all required hardware and software to communicate via BACnet to the existing Automated Logic BAS system.

## 2.5 HARDWIRED WALL MOUNTED CONTROLLER

- A. The controller shall support the following control options via soft-touch buttons: ON/OFF, set temperature, mode, fan speed, filter reminder reset, louver control, airflow direction, and single event timer setting.
- B. The controller shall have a wide, easy to read display.
- C. The controller shall support indoor unit option code setting, indoor unit addressing, and indoor unit option setting.
- D. The controller shall be mounted in a convenient location on the wall at a height of 60 inches above finish floor, see drawings for locations.

## Part 3 EXECUTION

### 3.1 GENERAL

- A. Where equipment furnished vary in dimensions, configuration, electrical characteristics, or location, etc., from the layout indicated on the drawings, the contractor shall make all modifications required to accommodate the actual equipment to be provided. Submission of shop drawings shall indicate acceptance of this responsibility.
- B. Where equipment is relocated to a place other than that shown on the drawings or when equipment other than that specified is used, the Contractor shall pay the entire cost of required revisions to such items as structural steel, concrete, electrical work, piping and ductwork.
- C. It is the full responsibility of this Contractor to ensure that the equipment he is providing fully conforms to this specification before submission to the Professional for review. This Contractor shall incur and shall be fully responsible for any and all costs associated with the equipment provided by a substitute manufacturer. Acceptance of the substitute manufacturer's equipment by the Professional will not relieve this Contractor of this responsibility.
- D. All sensors must be provided by the equipment manufacturer and shall be installed by this Contractor.

END OF SECTION 238120



SCHEDULE OF MATERIAL SUBMITTALS HVAC Contract*												Project No. DMVA 42160105		PROJECT TITLE HVAC & Exhaust Replacement Lock Haven FMS							
TO BE COMPLETED BY PROJECT ENGINEER												TO BE COMPLETED BY CONTRACT ADMINISTRATOR									
LINE NUMBER	ITEM OR DESCRIPTION OF ITEM, CONTRACT REFERENCE, TYPE OF SUBMITTAL	NUMBER OF COPIES REQUIRED										REQUIRED SUBMISSION DATE	DATE RECEIVED IN CONTRACTING	DATE TO MECHANICAL ENGINEERING	RETURN SUSPENSE DATE	SUBMITTAL NUMBERS	DATE CONTRACTOR NOTIFIED		CONTRACTOR RESUBMITTAL	FINAL APPROVAL	REMARKS
		STEEL CERTIFICATE OF COMPLIANCE	SHOP DRAWINGS	SCHEDULES	COLOR SELECTION	MANUFACTURER'S RECOMMENDATIONS	MANUFACTURER'S WARRANTY	CATALOG DATA	OPERATING INSTRUCTIONS	REPORTS	DELEGATED DESIGN						APPROVED	DIS- APPROVED			
1	230500-Fittings	5	5				5					NTP +10									
2	230510 - Control Wiring, Starters, Disconnects, etc.		5				5					NTP +10									
3	230553-Identification for HVAC Piping, Ducts & Equipment		5				5					NTP +10									
4	230593-Testing, Adjusting and Balancing								5												
5	230700 – HVAC Insulation		5				5					NTP +10									
6	230900-Instrumentation and Control for HVAC		5				5	5				NTP +10									
7	233113- Metal Ducts		5				5					NTP +10									
8	233300-Air Duct Accessories		5				5	5				NTP +10									
9	HVAC-Power Ventilators		5				5					NTP =10									
10	233713-Diffusers and Grilles		5				5					NTP +10									
11	237200 - Air to Air Energy Recovery Equipment		5				5	5				NTP +10									

SCHEDULE OF MATERIAL SUBMITTALS HVAC Contract*											Project No. DMVA 42160105		PROJECT TITLE HVAC & Exhaust Replacement Lock Haven FMS							
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		STEEL CERTIFICATE OF COMPLIANCE	SHOP DRAWINGS	SCHEDULES	COLOR SELECTION	MANUFACTURER'S RECOMMENDATIONS	MANUFACTURER'S WARRANTY	CATALOG DATA	OPERATING INSTRUCTIONS	REPORTS						DELEGATED DESIGN	APPROVED			
12	238120 – Ductless Fan Coil Systems		5				5	5	5			NTP +10								
13	Various – Equipment Training, O&M Manuals						3		3											
14	017839 – Hard Copy of As- Built Drawings																			
15	017839 – CD-ROM of As- Built Drawings in AutoCAD																			

\* NOTE: This form is provided for contract compliance and does not alleviate any requirements stated in the specifications. "NTP" – Notice to Proceed. Combine submittals where appropriate, line items are shown for control only.

## SECTION 220500

### COMMON WORK RESULTS FOR PLUMBING

#### PART 1 - GENERAL

##### 1.2 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Sleeves.
5. Escutcheons.
6. Equipment installation requirements common to equipment sections.
7. Supports and anchorages.
8. Cast-in-Place Concrete
9. Plumbing Demolition.

##### 1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than plumbing and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspace, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and plumbing equipment rooms.
- C. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

##### 1.4 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Electrical Characteristics for Plumbing 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.

## PART 2 - PRODUCTS

### 2.1 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

### 2.2 JOINING MATERIALS

- A. Refer to individual Division 22 piping Sections for special joining materials not listed below.
- B. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- C. Solvent Cements for Joining Plastic Piping:
  - 1. ABS Piping: ASTM D 2235.
  - 2. CPVC Piping: ASTM F 493.
  - 3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
  - 4. PVC to ABS Piping Transition: ASTM D 3138.

### 2.3 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
- D. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

### 2.4 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
- B. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

- C. Pressure Plates: Carbon steel. Include two for each sealing element.
- D. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## 2.5 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
  - 1. Underdeck Clamp: Clamping ring with set screws.
- E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe: ASTM D 1785, Schedule 40.
- G. Molded PE: Reusable, PE, tapered-cup shaped and smooth-outer surface with nailing flange for attaching to wooden forms.

## 2.6 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.

## 2.7 GROUT

- A. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.
  - 1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  - 2. Design Mix: 5000-psi, 28-day compressive strength.
  - 3. Packaging: Premixed and factory packaged.

## 2.8 CAST-IN-PLACE CONCRETE

- A. Normal-Weight Concrete: Prepare design mixes, proportioned according to ACI 301, as follows:
  - 1. Minimum Compressive Strength: 3000 psi at 28 days.
  - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
  - 3. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
  - 4. Slump Limit: 4 inches, plus or minus 1 inch.
  - 5. Air Content: Maintain within range permitted by ACI 301 (ACI 301M). Do not allow air content of trowel-finished floor slabs to exceed 3 percent.

## PART 3 - EXECUTION

### 3.1 PLUMBING DEMOLITION

- A. Refer to Division 1 Sections "Cutting and Patching" and "Selective Demolition & Restoration" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove plumbing systems, equipment, and components indicated to be removed.
  - 1. Equipment to Be Removed: Disconnect and cap services and remove equipment.
  - 2. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
  - 3. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

### 3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors.
- M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
- N. 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.
- O. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### 3.3 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

- E. 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.
- F. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
  - 3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
  - 4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
  - 5. PVC Non-pressure Piping: Join according to ASTM D 2855.
  - 6. PVC to ABS Non-pressure Transition Fittings: Join according to ASTM D 3138 Appendix.
- G. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- H. Plastic Non-pressure Piping Gasketed Joints: Join according to ASTM D 3212.

### 3.4 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
  - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
  - 2. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  - 3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

### 3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.



- D. Install equipment to allow right of way for piping installed at required slope.

### 3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.
- B. Field Welding: Comply with AWS D1.1.

### 3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

### 3.8 CONCRETE PLACEMENT

- A. Comply with ACI 301 for placing concrete.
- B. Do not add water to concrete during delivery, at Project site, or during placement.
- C. Consolidate concrete with mechanical vibrating equipment.

END OF SECTION 220500

SECTION 220553

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.2 RELATED DOCUMENTS

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

1.3 SUMMARY

- A. Section Includes:
  - 1. Equipment labels.
  - 2. Pipe labels.
  - 3. Valve tags.

1.4 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.

1.5 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.

- C. Install identifying devices before installing acoustical ceilings and similar concealment.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT LABELS

#### A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

#### B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

#### C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

### 2.2 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 partially cover 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 (38 mm) high.

## 2.3 VALVE TAGS

- A. Tags shall be brass, 1" diameter with large stamped numerals and attached by a short link brass chain or brass "S" hook.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

### 3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of plumbing equipment.
- B. Locate equipment labels where accessible and visible.

### 3.3 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. Domestic Cold Water Piping:
    - a. Background Color: Green.
    - b. Letter Color: White.
  - 2. Domestic Hot Water Piping:
    - a. Background Color: Green.
    - b. Letter Color: White.

3. Sanitary Waste Piping:
  - a. Background Color: Black.
  - b. Letter Color: White
4. Storm Drainage Piping:
  - a. Background Color: Gray.
  - b. Letter Color: White.
5. LP Gas Piping:
  - a. Background Color: [Yellow].
  - b. Letter Color: [Black].
  - c. All exterior and interior LP gas piping and fittings shall be painted with 2 coats semi-gloss high visibility bright yellow paint, before labels are attached.

C. Valve Tags

1. The Contractor shall tag each new valve for cold water, hot water, hot water recirculating and gas lines furnished under this Contract. The Contractor shall prepare three (3) lists on heavy white paper giving the valve number, its location, and the equipment controlled. One (1) list shall be enclosed in a metal frame under glass and mounted in the building where directed by the Owner. The other two (2) copies shall be delivered to the Architect.
2. In buildings where existing piping systems are modified, the new valve tag numbers and list shall be coordinated with existing valve tag numbers and lists and those supplied under other contracts, if applicable.

D. Ceiling Panel Identification

1. Provide colored plastic buttons and secure to liftout ceiling tiles to identify access points for valves.

END OF SECTION 220553

SECTION 220700

PLUMBING INSULATION

PART 1 - GENERAL

1.2 SUMMARY

A. Section Includes:

1. Insulation Materials:

- a. Flexible elastomeric.

1.3 SUBMITTALS

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

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Aeroflex USA Inc.; Aerocel.
  - b. Armacell LLC; AP Armaflex.
  - c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.
  - d. Or Approved Equal.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

#### 3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment 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 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 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.



### 3.3 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 Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- C. Insulation Installation at Floor Penetrations:
  - 1. Pipe: Install insulation continuously through floor penetrations.

### 3.4 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 Fittings and Elbows:
  - 1. Install mitered sections of pipe insulation.
  - 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Valves and Pipe Specialties:
  - 1. Install preformed valve covers manufactured of same material as pipe insulation when available.
  - 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
  - 3. Install insulation to flanges as specified for flange insulation application.
  - 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

### 3.5 FINISHES

- A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

- B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

### 3.6 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
  - 1. Drainage piping located in crawl spaces.
  - 2. Underground piping.
  - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

### 3.7 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Cold, Hot and Hot Recirculation Water: Insulation shall be one of the following:
  - 1. Flexible Elastomeric: 1 inch thick.
- B. Roof Drain Bodies and Rainwater Conductors: Insulation shall be one of the following:
  - 1. Flexible Elastomeric: 1 inch thick.

END OF SECTION 220700

SECTION 221116

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.2 SUMMARY

- A. Section Includes: Aboveground domestic water pipes, tubes and fittings inside the building.

1.3 SUBMITTALS

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

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
  - 1. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
  - 2. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.3 PIPING JOINING MATERIALS

- A. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

## 2.4 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.
- B. Dielectric Unions:
  - 1. Description:
    - a. Pressure Rating: 150 psig at 180 deg F.
    - b. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Nipples:
  - 1. Description:
    - a. Electroplated steel nipple complying with ASTM F 1545.
    - b. Pressure Rating: 300 psig at 225 deg F.
    - c. End Connections: Male threaded.
    - d. Lining: Inert and noncorrosive, propylene.

## PART 3 - EXECUTION

### 3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install shutoff valve immediately upstream of each dielectric fitting.
- C. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.
- D. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- G. Install piping adjacent to equipment and specialties to allow service and maintenance.
- H. Install piping to permit valve servicing.

- I. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.
- J. Install piping free of sags and bends.
- K. Install fittings for changes in direction and branch connections.
- L. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- M. Install sleeves for piping penetrations of walls, ceilings, and floors.
- N. Install sleeve seals for piping penetrations of concrete walls and slabs.
- O. Install escutcheons for piping penetrations of walls, ceilings, and floors.

### 3.2 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- E. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

### 3.3 VALVE INSTALLATION

- A. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball valves for piping NPS 2 and smaller

### 3.4 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

### 3.5 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions or nipples.

### 3.6 HANGER AND SUPPORT INSTALLATION

- A. Support vertical piping and tubing at base and at each floor.
- B. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch (10 mm).
- C. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
  - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
  - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
- D. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

### 3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment and machines to allow service and maintenance.
- C. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
  - 1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
  - 2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Comply with requirements in Division 22 plumbing fixture Sections for connection sizes.

### 3.8 FIELD QUALITY CONTROL

- A. Piping Inspections:
  - 1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
  - 2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

- a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  - b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
  4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Piping Tests:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and for corrective action required.

C. Domestic water piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

### 3.9 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
  - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
  - b. Fill and isolate system according to either of the following:
    - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
    - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

- c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
- d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

### 3.10 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:
  1. Hard copper tube, ASTM B 88, Type L; wrought- copper solder-joint fittings; and soldered joints.

### 3.11 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  1. Shutoff Duty: Use ball valves for piping NPS 2 and smaller.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 221116



SECTION 221119

DOMESTIC WATER PIPING VALVES AND SPECIALTIES

PART 1 - GENERAL

1.2 SUMMARY

A. Section Includes:

1. Balancing valves.
2. Water-hammer arresters.
3. Bronze ball valves.

B. Related Requirements:

1. Section 224000 "Plumbing Fixtures" for supports and guards for plumbing fixtures.

1.3 SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 BALANCING VALVES

A. Memory-Stop Balancing Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Crane Co.; Crane Valve Group; Crane Valves.
  - b. Hammond Valve.
  - c. NIBCO INC.
2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
3. Pressure Rating: 400-psig minimum CWP.
4. Size: NPS 2 or smaller.
5. Body: Copper alloy.
6. Port: Standard or full port.
7. Ball: Chrome-plated brass.
8. Seats and Seals: Replaceable.
9. End Connections: Solder joint or threaded.
10. Handle: Vinyl-covered steel with memory-setting device.

#### 2.4 WATER-HAMMER ARRESTERS

##### A. Water-Hammer Arresters, WHA:

1. Standard: ASSE 1010 or PDI-WH 201.
2. Type: Copper tube with piston.
3. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

#### 2.5 BRONZE BALL VALVES

##### A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

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. Crane Co.; Crane Valve Group; Crane Valves.
  - b. NIBCO INC.
  - c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
  - a. Standard: MSS SP-110.
  - b. SWP Rating: 150 psig.
  - c. CWP Rating: 600 psig.
  - d. Body Design: Two piece.
  - e. Body Material: Bronze.
  - f. Ends: Threaded.
  - g. Seats: PTFE or TFE.
  - h. Stem: Bronze.
  - i. Ball: Chrome-plated brass.

- j. Port: Full.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install balancing valves in locations where they can easily be adjusted.
- B. Install water-hammer arresters in water piping according to PDI-WH 201.
- C. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.
- D. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- E. Locate valves for easy access and provide separate support where necessary.
- F. Install valves in horizontal piping with stem at or above center of pipe.
- G. Install valves in position to allow full stem movement.

#### 3.2 ADJUSTING

- A. Set field-adjustable flow of balancing valves.
- B. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

#### 3.3 DOMESTIC, COLD- AND HOT- WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
  - 1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
  - 2. Ball Valves: Two piece, full port, bronze with bronze trim.
  - 3. Bronze Swing Check Valves: Class 125, bronze disc.

END OF SECTION 221119

## SECTION 221126

### FACILITY LIQUEFIED-PETROLEUM GAS PIPING

#### PART 1 - GENERAL

##### 1.2 RELATED DOCUMENTS

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

##### 1.3 SUMMARY

- A. Section Includes:
  - 1. Pipes, tubes, and fittings.
  - 2. Piping specialties.
  - 3. Piping and tubing joining materials.
  - 4. Valves.
  - 5. Pressure regulators.
  - 6. Storage containers.

##### 1.4 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. LPG: Liquefied-petroleum gas.

##### 1.5 PERFORMANCE REQUIREMENTS

- A. Minimum Operating-Pressure Ratings:

1. For Piping Containing Only Vapor:
  - a. Piping and Valves: 125 psig unless otherwise indicated.
- B. LPG System Pressure within Buildings: One pressure range. 0.5 psig or less

#### 1.6 SUBMITTALS

- A. Product Data: For each type of the following:
  1. Piping specialties.
  2. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
  3. Pressure regulators. Indicate pressure ratings and capacities.
  4. Dielectric fittings.
  5. Storage containers.
- B. Operation and Maintenance Data: For LPG equipment and accessories to include in emergency, operation, and maintenance manuals.

#### 1.7 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 pipes and tubes with protective PE coating to avoid damaging coating and protect from direct sunlight.
- C. Protect stored PE pipes and valves from direct sunlight.

#### 1.8 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

#### 1.9 COORDINATION

- A. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces. Comply with requirements in Division 08 Section "Access Doors and Frames."

## PART 2 - PRODUCTS

### 2.1 PIPES, TUBES, AND FITTINGS

#### A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedules 40 and 80, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
3. Mechanical Couplings:
  - a. Steel flanges and tube with epoxy finish.
  - b. Buna-nitrile seals.
  - c. Steel bolts, washers, and nuts.
  - d. Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
  - e. Steel body couplings installed underground on plastic pipe shall be factory equipped with anode.

#### B. PE Pipe: ASTM D 2513, SDR 11.

1. PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
2. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
3. Anodeless Service-Line Risers: Factory fabricated and leak tested.
  - a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet.
  - b. Casing: Steel pipe complying with ASTM A 53/A 53M, Schedule 40, black steel, Type E or S, Grade B with corrosion-protective coating covering. [ **Vent casing aboveground.**]
  - c. Aboveground Portion: PE transition fitting.
  - d. Outlet shall be threaded or flanged or suitable for welded connection.
  - e. Tracer wire connection.
  - f. Ultraviolet shield.
  - g. Stake supports with factory finish to match steel pipe casing or carrier pipe.
4. Plastic Mechanical Couplings, NPS 2 and Smaller: Capable of joining PE pipe to PE pipe.
  - a. PE body with molded-in, stainless-steel support ring.
  - b. Buna-nitrile seals.
  - c. Acetal collets.
  - d. Electro-zinc-plated steel stiffener.
5. Steel Mechanical Couplings: Capable of joining plain-end PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.

- a. Steel flanges and tube with epoxy finish.
  - b. Buna-nitrile seals.
  - c. Steel bolts, washers, and nuts.
  - d. Factory-installed anode for steel-body couplings installed underground.
- C. Drawn-Temper Copper Tube: Comply with ASTM B 88, Type K.
- 1. Copper Fittings: ASME B16.22, wrought copper, and streamlined pattern.
  - 2. Bronze Flanges and Flanged Fittings: ASME B16.24, Class 150.
    - a. Gasket Material: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
    - b. Bolts and Nuts: ASME B18.2.1, carbon steel or stainless steel.
  - 3. Protective Coating for Underground Tubing: Factory-applied, extruded PE a minimum of 0.022 inch thick.

## 2.2 PIPING SPECIALTIES

### A. Flexible Piping Joints:

- 1. Approved for LPG service.
- 2. Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
- 3. Minimum working pressure of 250 psig and 250 deg F operating temperature.
- 4. Flanged- or threaded-end connections to match equipment connected and shall be capable of minimum 3/4-inch misalignment.
- 5. Maximum 36-inch length for liquid LPG lines.

### B. Appliance Flexible Connectors:

- 1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
- 2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
- 3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
- 4. Corrugated stainless-steel tubing with polymer coating.
- 5. Operating-Pressure Rating: 0.5 psig.
- 6. End Fittings: Zinc-coated steel.
- 7. Threaded Ends: Comply with ASME B1.20.1.
- 8. Maximum Length: 72 inches.

### C. Basket Strainers:

- 1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
- 2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
- 3. Strainer Screen: 40-mesh startup strainer and perforated stainless-steel basket with 50 percent free area.
- 4. CWP Rating: 125 psig.

- D. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

## 2.3 JOINING MATERIALS

- A. Joint Compound and Tape: Suitable for LPG.

## 2.4 MANUAL GAS SHUTOFF VALVES

- A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.
  - 1. Body: Bronze, complying with ASTM B 584.
  - 2. Ball: Chrome-plated bronze.
  - 3. Stem: Bronze; blowout proof.
  - 4. Seats: Reinforced TFE; blowout proof.
  - 5. Packing: Threaded-body packnut design with adjustable-stem packing.
  - 6. Ends: Threaded, flared, or socket CWP Rating: 600 psig.
  - 7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
  - 8. Service: Suitable for LPG service with "WOG" indicated on valve body.

## 2.5 PRESSURE REGULATORS

- A. General Requirements:
  - 1. Single stage and suitable for LPG.
  - 2. Steel jacket and corrosion-resistant components.
  - 3. Elevation compensator.
  - 4. End Connections: Threaded for regulators NPS 2 and smaller.
- B. Service Pressure Regulators: Comply with ANSI Z21.80.
  - 1. Body and Diaphragm Case: Cast iron or die-cast aluminum.
  - 2. Springs: Zinc-plated steel; interchangeable.
  - 3. Diaphragm Plate: Zinc-plated steel.
  - 4. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
  - 5. Orifice: Aluminum; interchangeable.
  - 6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
  - 7. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet and no pressure sensing piping external to the regulator.
  - 8. Pressure regulator shall maintain discharge pressure setting downstream and not exceed 150 percent of design discharge pressure at shutoff.
  - 9. Overpressure Protection Device: Factory mounted on pressure regulator.
  - 10. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
  - 11. Maximum Inlet Pressure: 125 psig.



## 2.6 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
  - 1. Description:
    - a. Standard: ASSE 1079.
    - b. Pressure Rating: 125 psig minimum at 180 deg F.
    - c. End Connections: Solder-joint copper alloy and threaded ferrous.

## 2.7 STORAGE CONTAINERS

- A. Description: Factory fabricated, complying with requirements in NFPA 58 and ASME Boiler and Pressure Vessel Code and bearing the ASME label. Tanks shall be rated for 250-psig minimum working pressure.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. American Welding & Tank.
    - b. Hanson, Roy E. Jr. Mfg.
    - c. Trinity Industries, Inc.
    - d. United Industries Group, Inc.
  - 2. Liquid outlet and vapor inlet and outlet connections shall have shutoff valves with excess-flow safety shutoff valves and bypass and back-pressure check valves with smaller than 0.039-inch drill-size hole to equalize pressure. Liquid-fill connection shall have backflow check valve.
    - a. Connections: Color-code and tag valves to indicate type.
      - 1) Liquid fill and outlet, red.
      - 2) Vapor inlet and outlet, yellow.
  - 3. Level gage shall indicate current level of liquid in the container. Gages shall also indicate storage container contents; e.g., "Butane," "50-50 LPG Mix," or "Propane."
  - 4. Pressure relief valves, type and number as required by NFPA 58, connected to vapor space and having discharge piping same size as relief-valve outlet and long enough to extend at least 84 inches directly overhead. Identify relief valves as follows:
    - a. Discharge pressure in psig.
    - b. Rate of discharge for standard air in cfm.
    - c. Manufacturer's name.
    - d. Catalog or model number.
  - 5. Container pressure gage.

6. For outdoor installation, exposed metal surfaces mechanically cleaned, primed, and painted for resistance to corrosion.
7. Ladders for access to valves more than 72 inches aboveground.
8. Stainless-Steel Nameplate: Attach to aboveground storage container or to adjacent structure for underground storage container.
  - a. Name and address of supplier or trade name of container.
  - b. Water capacity in gallons and liters.
  - c. Design pressure in psig (kPa).
  - d. Statement, "This container shall not contain a product having a vapor pressure in excess of 250 psig at 100 deg F."
  - e. Outside surface area in sq. ft. (sq. m).
  - f. Year of manufacture.
  - g. Shell thickness in inches (mm).
  - h. Overall length in feet (m).
  - i. OD in feet (m).
  - j. Manufacturer's serial number.
  - k. ASME Code label.
9. Felt support pads and two concrete or painted-steel saddles per storage container. Corrosion protection required at container-to-felt contact.

## 2.8 LABELING AND IDENTIFYING

- A. Detectable Warning Tape: Acid- and alkali-resistant PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine roughing-in for LPG piping system to verify actual locations of piping connections before equipment installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 EARTHWORK

- A. Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

### 3.3 OUTDOOR PIPING INSTALLATION

- A. Comply with NFPA 58 and the International Fuel Gas Code requirements for installation and purging of LPG piping.
- B. Install underground, LPG piping buried at least 36 inches below finished grade. Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.
  - 1. If LPG piping is installed less than 36 inches below finished grade, install it in containment conduit.
- C. Install underground, PE, LPG piping according to ASTM D 2774.
- D. Steel Piping with Protective Coating:
  - 1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
  - 2. Replace pipe having damaged PE coating with new pipe.
- E. Copper Tubing with Protective Coating:
  - 1. Apply joint cover kits over tubing to cover, seal, and protect joints.
  - 2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
- F. Install fittings for changes in direction and branch connections.

### 3.4 INDOOR PIPING INSTALLATION

- A. Comply with the International Fuel Gas Code for installation and purging of LPG piping.
- 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, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.
- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Locate valves for easy access.
- H. Install LPG piping at uniform grade of 2 percent down toward drip and sediment traps.

- I. Install piping free of sags and bends.
- J. Install fittings for changes in direction and branch connections.
- K. Verify final equipment locations for roughing-in.
- L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
- M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where readily accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
  - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
- O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
- P. Concealed Location Installations:
  - 1. Above Accessible Ceilings: LPG piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
  - 2. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.
    - a. Exception: Tubing passing through partitions or walls does not require striker barriers.
  - 3. Prohibited Locations:
    - a. Do not install LPG piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
    - b. Do not install LPG piping in solid walls or partitions.
- Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- R. Connect branch piping from top or side of horizontal piping.
- S. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.
- T. Do not use LPG piping as grounding electrode.

### 3.5 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.
- B. Install underground valves with valve boxes.
- C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.
- D. Install anode for metallic valves in underground PE piping.

### 3.6 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:
  - 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
  - 2. Cut threads full and clean using sharp dies.
  - 3. Ream threaded pipe ends to remove burrs and restore full ID of pipe.
  - 4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
  - 5. 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.
- D. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
  - 1. Plain-End Pipe and Fittings: Use butt fusion.
  - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.

### 3.7 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hangers and supports specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
  - 1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
  - 2. NPS 1-1/4 to NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.

### 3.8 CONNECTIONS

- A. Install LPG piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- B. Install piping adjacent to appliances to allow service and maintenance of appliances.
- C. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliances and equipment. Install union between valve and appliances or equipment.
- D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

### 3.9 STORAGE CONTAINER INSTALLATION

- A. Fill storage container to at least 80 percent capacity with propane.
- B. Install piping connections with swing joints or flexible connectors to allow for storage container settlement and for thermal expansion and contraction.
- C. Ground containers according to NFPA 780. Grounding is specified in Division 26 Section "Lightning Protection for Structures."
- D. Set storage containers in felt pads on concrete or steel saddles. Install corrosion protection at container-to-felt contact.

### 3.10 LABELING AND IDENTIFYING

- A. Comply with requirements in Division 23 Section "Identification for HVAC Piping and Equipment" for piping and valve identification.
- B. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

### 3.11 PAINTING

- A. Comply with requirements in Division 09 painting Sections for painting interior and exterior LPG piping.
- B. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components with factory-applied paint or protective coating.
  - 1. Alkyd System: MPI EXT 5.1D.
    - a. Prime Coat: Alkyd anticorrosive metal primer.
    - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
    - c. Topcoat: Exterior alkyd enamel flat.

- d. Color: Yellow.
- C. Paint exposed, interior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components with factory-applied paint or protective coating.
  - 1. Alkyd System: MPI INT 5.1E.
    - a. Prime Coat: Alkyd anticorrosive metal primer.
    - b. Intermediate Coat: Interior alkyd matching topcoat.
    - c. Topcoat: Interior alkyd flat.
    - d. Color: Yellow.
- D. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

### 3.12 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
  - 1. Test, inspect, and purge LPG according to NFPA 58 and requirements of authorities having jurisdiction.
- C. LPG piping will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

### 3.13 DEMONSTRATION

- A. Contractor shall train Owner's maintenance personnel to adjust, operate, and maintain LPG equipment.

### 3.14 OUTDOOR PIPING SCHEDULE

- A. Underground LPG liquid piping shall be one of the following:
  - 1. Drawn-temper copper tube, Type K with wrought-copper fittings and brazed joints. Coat pipe and fittings with protective coating for copper tubing.
  - 2. PE pipe and fittings joined by heat fusion or mechanical couplings; service line risers with tracer wire terminated in an accessible location.
- B. Aboveground LPG liquid piping shall be the following:
  - 1. Schedule 40 steel pipe, malleable-iron threaded fittings and threaded joints. Coat pipe and fittings with protective coating for steel piping.
- C. Underground LPG vapor piping shall be one of the following:

1. PE pipe and fittings joined by heat-fusion, or mechanical couplings; service-line risers with tracer wire terminated in an accessible location.
  2. Drawn-temper copper tube, Type L with wrought-copper fittings and brazed joints. Coat pipe and fittings with protective coating for copper tubing.
- D. Aboveground LPG vapor piping shall be the following:
1. Schedule 40, steel pipe with malleable-iron fittings and threaded joints.
- E. Branch Piping in Cast-in-Place Concrete to Single Appliance: Annealed-temper copper, with wrought-copper fittings and brazed joints. Install piping embedded in concrete with no joints in concrete.
- F. Containment Conduit: Schedule 40, steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
- 3.15 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG
- A. Aboveground, branch piping NPS 2 and smaller shall be the following:
1. Schedule 40, steel pipe with malleable-iron fittings and threaded joints.

END OF SECTION 231126



SECTION 221316

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.2 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.

1.3 SUBMITTALS

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

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service class.
- B. Gaskets: ASTM C 564, rubber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. ANACO-Husky.
  - b. Dallas Specialty & Mfg. Co.
  - c. Fernco Inc.
2. Standards: ASTM C 1277 and CISPI 310.
3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. ANACO-Husky.
  - b. Clamp-All Corp.
  - c. Dallas Specialty & Mfg. Co.
2. Standards: ASTM C 1277 and ASTM C 1540.
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 COPPER TUBE AND FITTINGS

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
- B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
- C. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.5 PVC PIPE AND FITTINGS

- A. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.
- B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- C. Adhesive Primer: ASTM F 656.
  1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  2. Adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Solvent Cement: ASTM D 2564.

1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
3. Unshielded, Nonpressure Transition Couplings:
  - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - 1) Dallas Specialty & Mfg. Co.
    - 2) Fernco Inc.
    - 3) Mission Rubber Company; a division of MCP Industries, Inc.
  - b. Standard: ASTM C 1173.
  - c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
  - d. Sleeve Materials:
    - 1) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
    - 2) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- I. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- J. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
  1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 2 percent downward in direction of flow for piping NPS 4 and larger.
  2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
  3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- K. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- L. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."
- M. Install aboveground PVC piping according to ASTM D 2665.
- N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- O. Install sleeves for piping penetrations of walls, ceilings, and floors.
- P. Install sleeve seals for piping penetrations of concrete walls and slabs.
- Q. Install escutcheons for piping penetrations of walls, ceilings, and floors.

### 3.2 JOINT CONSTRUCTION

- A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- C. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.
- D. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

### 3.3 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
  - 1. Install transition couplings at joints of piping with small differences in OD's.
  - 2. In Drainage Piping: Unshielded, nonpressure transition couplings.

### 3.4 HANGER AND SUPPORT INSTALLATION

- A. Support horizontal piping and tubing within 12 inches of each fitting and coupling.
- B. Support vertical piping and tubing at base and at each floor.
- C. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- D. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
  - 2. NPS 3: 60 inches with 1/2-inch rod.
  - 3. NPS 4: 60 inches with 5/8-inch rod.
  - 4. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- E. Install supports for vertical cast-iron soil piping every 15 feet.
- F. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/4: 72 inches with 3/8-inch rod.
  - 2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
  - 3. NPS 2-1/2: 108 inches with 1/2-inch rod.

- 4. NPS 3 and NPS 4: 10 feet with 1/2-inch rod.
- G. Install supports for vertical PVC piping every 48 inches.
- H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.5 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
  - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- E. Make connections according to the following unless otherwise indicated:
  - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

### 3.6 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
  - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
  - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

### 3.7 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

### 3.8 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:
  1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
  2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
  3. Copper DWV tube, copper drainage fittings, and soldered joints.
  4. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.
- C. Aboveground, vent piping NPS 4 and smaller shall be the following:
  1. Cellular-core PVC pipe, PVC socket fittings, and solvent-cemented joints.
  2. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.
- D. Underground, soil, waste, and vent piping NPS 4 and smaller shall be the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
3. Copper DWV tube, copper drainage fittings, and soldered joints.
4. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

END OF SECTION 221316



SECTION 221319

SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.2 SUMMARY

A. Section Includes:

1. Floor cleanouts.
2. Floor drains.

1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. FRP: Fiberglass-reinforced plastic.
- C. HDPE: High-density polyethylene plastic.
- D. PE: Polyethylene plastic.
- E. PP: Polypropylene plastic.
- F. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include materials and finishes, and dimensions, construction details.

PART 2 - PRODUCTS

2.1 CLEANOUTS

- A. Metal Floor Cleanouts, FCO:

1. ASME A112.36.2M, Cast-Iron Cleanouts:
2. Standard: ASME A112.36.2M for adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Not required.
7. Closure: Brass plug with tapered threads.
8. Adjustable Housing Material: Cast iron with threads.
9. Frame and Cover Material and Finish: Polished Nickel-bronze.
10. Frame and Cover Shape: Round.
11. Top Loading Classification: Heavy Duty.
12. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

B. Cast-Iron Wall Cleanouts WCO:

1. Standard: ASME A112.36.2M. Include wall access.
2. Size: Same as connected drainage piping.
3. Body: Hub-and-spigot as required to match connected piping.
4. Closure: Countersunk brass plug.
5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
6. Wall Access: Round, flat, chrome-plated brass cover plate with screw.

## 2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains, FD-1:

1. Standard: ASME A112.6.3.
2. Pattern: Floor drain.
3. Body Material: Cast iron.
4. Seepage Flange: Required.
5. Anchor Flange: Not required.
6. Clamping Device: Required.
7. Outlet: Bottom.
8. Coating on Interior and Exposed Exterior Surfaces: Not required.
9. Strainer Material: Polished nickel bronze.
10. Strainer Shape: Round.
11. Dimensions of Top or Strainer: 6 inch diameter.
12. Top Loading Classification: Heavy Duty.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4.
2. Locate at each change in direction of piping greater than 45 degrees.

3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller.
  4. Locate at base of each vertical soil and waste stack.
- B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- C. Install floor drains at low points of surface areas to be drained.
1. Position floor drains for easy access and maintenance.
  2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
    - a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
    - b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
    - c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.
  3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
  4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

### 3.2 CONNECTIONS

- A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

### 3.3 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 224000

PLUMBING FIXTURES

PART 1 - GENERAL

B. This Section includes the following conventional plumbing fixtures and related components:

1. Faucets for lavatories.
2. Toilet seats.
3. Protective shielding guards.
4. Fixture supports.
5. Water closets.
6. Urinals.
7. Lavatories.
8. Showers.
9. Mop receptors.
10. Electric water coolers.

1.2 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
- C. Cast Polymer: Cast-filled-polymer-plastic material. This material includes cultured-marble and solid-surface materials.
- D. Cultured Marble: Cast-filled-polymer-plastic material with surface coating.
- E. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.
- F. FRP: Fiberglass-reinforced plastic.
- G. PMMA: Polymethyl methacrylate (acrylic) plastic.
- H. PVC: Polyvinyl chloride plastic.

- I. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

### 1.3 SUBMITTALS

- A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.
- B. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.
- C. Warranty: Special warranty specified in this Section.

### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
  1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.
- B. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- C. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

### 1.5 WARRANTY

1. Warranty Period for Commercial Applications: One year from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 LAVATORY FAUCETS

- A. Lavatory Faucets (ADA), P-3:
  1. Product: Subject to compliance with requirements, provide product by one of the following:
    - a. Delta Faucet Company.
    - b. Kohler Co.
    - c. Moen, Inc.
    - d. Or approved equal.

2. Description: Two-handle mixing valve. Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
  - a. Standards: ASME A112.18.1/CSA B125.1 and UL 1951.
  - b. Body Material: Commercial, solid brass.
  - c. Finish: Polished chrome plate.
  - d. Maximum Flow Rate: 0.5 gpm.
  - e. Centers: 4 inches
  - f. Mounting Type: Deck.
  - g. Valve Handle(s): Wrist blade, 4 inches.
  - h. Inlet(s): NPS 1/2 male shank.
  - i. Spout: Rigid.
  - j. Spout Outlet: Vandal resistant spray head.
  - k. Operation: Quarter-turn cartridges.
  - l. Drain: Grid.
  - m. Tempering Device: Below the deck mechanical mixing valve, ASSE 1070 approved for temperature and pressure protection.

## 2.2 FLUSHOMETERS

### A. Flushometers, P-2:

1. Product: Subject to compliance with requirements, provide product by one of the following:
  - a. Delta Faucet Company.
  - b. Zurn Plumbing Products Group; Commercial Brass Operation.
  - c. TOTO USA, Inc.
  - d. Or Approved Equal.
2. Description: Flushometer for urinal-type fixture. Include brass body with corrosion-resistant internal components, non-hold-open feature, control stop with check valve, vacuum breaker, copper or brass tubing, and polished chrome-plated finish on exposed parts.
  - a. Internal Design: Diaphragm operation.
  - b. Style: Exposed.
  - c. Inlet Size: NPS 3/4.
  - d. Trip Mechanism: Oscillating, lever-handle actuator.
  - e. Consumption: 0.5 gal./flush.
  - f. Tailpiece Size: NPS 3/4 and standard length to top of bowl.

## 2.3 TOILET SEATS

### A. Toilet Seats, P-1:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Beneke 523 or a comparable product by one of the following:

- a. American Standard Companies, Inc.
  - b. Church Seats.
  - c. Olsonite Corp.
  - d. Or Approved Equal.
2. Description: Toilet seat for water-closet-type fixture.
- a. Material: Molded, solid plastic.
  - b. Configuration: Open front without cover.
  - c. Size: Elongated.
  - d. Hinge Type: CK, check.
  - e. Class: Heavy-duty commercial.
  - f. Color: White.

## 2.4 PROTECTIVE SHIELDING GUARDS

### A. Protective Shielding Piping Enclosures, P-3:

- 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. TRUEBRO, Inc.
  - b. Or Approved Equal.
- 2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

## 2.5 FIXTURE SUPPORTS

### 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. Smith, Jay R. Mfg. Co.
- 2. Watts Drainage Products Inc.; a div. of Watts Industries, Inc.
- 3. Zurn Plumbing Products Group; Specification Drainage Operation.
- 4. Or Approved Equal.

### B. Urinal Supports, P-2:

- 1. Description: Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture for wall-mounting, urinal-type fixture. Include steel uprights with feet.
- 2. Accessible-Fixture Support: Include rectangular steel uprights.

### C. Lavatory Supports, P-3:

- 1. Description: Type II, lavatory carrier with concealed arms and tie rod for wall-mounting, lavatory-type fixture. Include steel uprights with feet.
- 2. Accessible-Fixture Support: Include rectangular steel uprights.

## 2.6 WATER CLOSETS

### A. Water Closets (ADA), P-1:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Kohler Highline K-3989 or a comparable product by one of the following:
  - a. American Standard Companies, Inc.
  - b. Crane Plumbing, L.L.C./Fiat Products.
  - c. TOTO USA, Inc.
  - d. Or Approved Equal.
2. Description: Floor-mounting, bottom outlet, vitreous-china fixture designed for flushometer valve operation.
  - a. Bowl Type: Elongated with siphon-jet design. Include bolt caps matching fixture.
  - b. Height: ADA.
  - c. Water Consumption: 1.6 gal./flush
  - d. Spud Size and Location: NPS 1/2; tank.
  - e. Color: White.
  - f. Toilet Seat: P-1A.

## 2.7 URINALS

### A. Urinals, P-2:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Kohler Dexter K-5016-ET or a comparable product by one of the following:
  - a. American Standard Companies, Inc.
  - b. Crane Plumbing, L.L.C./Fiat Products.
  - c. TOTO USA, Inc.
  - d. Or Approved Equal.
2. Description: Accessible, wall-mounting, back-outlet, vitreous-china fixture designed for flushometer valve operation.
  - a. Type: Siphon jet.
  - b. Strainer or Trapway: Open trapway with integral trap.
  - c. Rim Height (P-2): 24 inches above floor.
  - d. Rim Height (P-2A): 17 inches above floor.
  - e. Water Consumption: 0.5 gal./flush.
  - f. Spud Size and Location: NPS 3/4; top.
  - g. Color: White.
  - h. Outlet Size: NPS 2.
  - i. Flushometer: P-2, P-2A.



## 2.8 LAVATORIES

### A. Lavatories (ADA), P-3:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Kohler Kingston K-2005 or a comparable product by one of the following:
  - a. American Standard Companies, Inc.
  - b. Crane Plumbing, L.L.C.
  - c. TOTO USA, Inc.
  - d. Or Approved Equal.
2. Description: Wall-mounting, vitreous-china fixture.
  - a. Type: Ledge back.
  - b. Size: 21 by 18 inches rectangular.
  - c. Faucet Hole Punching: Three holes, 4-inch.
  - d. Faucet Hole Location: Top.
  - e. Color: White.
  - f. Faucet: Lavatory P-3, P-3A.
  - g. Protective Shielding Guard(s): P-3, P-3A.
  - h. Fixture Support: Lavatory P-3, P-3A.

## 2.9 UTILITY SINKS

### A. Utility Sinks, P-4:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Just Manufacturing Model SL-1921-A-GR or comparable product by one of the following:
  - a. Advance Tabco.
  - b. Elkay Manufacturing Co.
  - c. Griffin Products, Inc.
2. Fixture:
  - a. Standard: ASME A112.19.3/CSA B45.4.
  - b. Type: Ledge back.
  - c. Number of Compartments: One.
  - d. Overall Dimensions: 21 inches by 19 inches.
  - e. Material: Stainless steel.
  - f. Metal Thickness: 18 gauge.
  - g. Compartment:
    - 1) Dimensions: 22 inches by 16 inches.
    - 2) Drain: NPS 1-1/2 tailpiece with stopper.
    - 3) Drain Location: Centered in compartment.
3. Mounting: On counter with sealant.

## 2.10 SINK FAUCETS

### A. Utility sink faucet, P-4:

1. Commercial, Solid-Brass Faucets:
  - a. Basis-of-Design Product: Subject to compliance with requirements, provide Just Manufacturing Model JWF-200 or comparable product by one of the following:
    - 1) American Standard America.
    - 2) Kohler Co.
    - 3) Moen Incorporated.
2. Standard: ASME A112.18.1/CSA B125.1.
3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
4. Body Type: Widespread.
5. Body Material: Commercial, cast brass.
6. Finish: Chrome plated.
7. Maximum Flow Rate: 2.2 gpm.
8. Handle(s): Wrist blade, 4 inches.
9. Mounting Type: Deck, concealed.
10. Spout Type: High rise swing.
11. Spout Outlet: Aerator.

## 2.11 MOP RECEPTOR

### A. Mop Receptor, P-5:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Fiat MSB 2424 or a comparable product by one of the following:
  - a. Acorn Engineering Company.
  - b. Swan Corporation (The).
  - c. Zurn Plumbing Products Group; Light Commercial Operation.
2. Description: Flush-to-wall, floor-mounting, cast-polymer fixture with rim guard.
  - a. Shape: Square.
  - b. Size: 24 by 24 inches.
  - c. Height: 10 inches.
  - d. Rim Guard: On all top surfaces.
  - e. Color: White.
  - f. Faucet: Sink Fiat 830-AA or approved equal. Chrome plated, back mounted, with wall support, vacuum breaker, hose threaded spout and bucket hook
  - g. Drain: Grid with NPS 3 outlet.

## 2.12 ELECTRIC WATER COOLERS

### A. Electric Water Cooler with bottle fill, P-6:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Elkay LVRCGRN8WSK or a comparable product by one of the following:
  - a. Oasis International Inc.
  - b. Haws Corporation.
  - c. Larco, Inc.
  - d. Or Approved Equal.
2. Description: ADA compliant, wall-mounted water cooler with bottle filling station.
  - a. Cabinet: Greystone powder coated paint on brushed stainless-steel with stainless-steel drain pans.
  - b. Bubbler: One, with adjustable stream regulator, located on cabinet deck.
  - c. Control: Front vandal resistant push button.
  - d. Bottle fill: one with electronic sensor for touchless activation with 20-second shut-off timer
  - e. Supply: NPS 1/2 with ball valve.
  - f. Filter: Water filters complying with NSF 42 and NSF 53 for cyst and lead reduction to below EPA standards; with capacity sized for unit peak flow rate.
  - g. Drain(s): Grid with NPS 1-1/4 minimum horizontal waste and trap complying with ASME A112.18.1.
  - h. Cooling System: Electric, with hermetically sealed R-134a compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.
    - 1) Capacity: 8 gph of 50 deg F cooled water from 80 deg F inlet water and 90 deg F ambient air temperature.
    - 2) Electrical Characteristics: FLA 3.8 amps; 120-V ac; single phase; 60 Hz.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.
- B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

- B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.
  - 1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
  - 2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
  - 3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
- C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.
- D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
- E. Install wall-mounting fixtures with tubular waste piping attached to supports.
- F. Install fixtures level and plumb according to roughing-in drawings.
- G. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
  - 1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture. Valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."
- H. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- I. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.
- J. Install toilet seats on water closets.
- K. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- L. Install traps on fixture outlets.
  - 1. Exception: Omit trap on fixtures with integral traps.
  - 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
- M. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings.
- N. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

### 3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

- B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

#### 3.4 FIELD QUALITY CONTROL

- A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.
- B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

#### 3.5 ADJUSTING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.
- C. Replace washers and seals of leaking and dripping faucets and stops.

#### 3.6 CLEANING

- A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:
  - 1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
  - 2. Remove sediment and debris from drains.
- B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

#### 3.7 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224000



SECTION 260500

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

- B. Contractor: “Contractor”, “this Contractor” or “Electrical Contractor” when used in Divisions 26, 27, and 28 Specification Sections refers to the Contractor responsible for all work under this section.
- C. Sub-Contractor: Any reference to, or letting of work contained in these specifications to any Sub-Contractor or Manufacture does not relieve this Contractor for all work, material and equipment in these specifications.
- D. All references made to any item in the singular number shall apply to as many identical items that the work may require.
- E. Where applicable, all materials and equipment shall bear the label of the Underwriters Laboratory, Inc., or other nationally recognized testing laboratory and shall be used and/or installed in accordance with any instructions included with the listing or labeling.
- F. The sizes of conductors and thickness of metals shown on the drawings or mentioned herein shall be understood to be American Wire Gauge.
- G. All materials shall be made from steel manufactured in America and certification shall be submitted.
- H. Any reference made to the “Engineer” in these specifications shall refer to the Personnel of the Engineering Design Division of the Department of General Services.
- I. Any reference made to the “Department” in these specifications shall refer to the Personnel of the Department of General Services.
- J. Any reference made to the “Using Agency” in these specifications shall refer to the Personnel of the Department of Military & Veteran’s Affairs.

1.2 SUMMARY

- A. This Section applies to all Divisions 26, 27 and 28 Sections and includes the following:
  - 1. General Provisions:

- a. Definitions.
- b. Intent.
- c. Work Included.
- d. Responsibility of Bidders.
- e. Quality Assurance.
- f. Submittals.
- g. Substitutions.
- h. Guarantees.
- i. Regulations.
- j. Standards and References.
- k. Permits and Inspections.
- l. Project/Site Conditions.
- m. Delivery, Storage and Handling.
- n. Protection of Services and Equipment.
- o. Sequencing, Scheduling and Coordination.
- p. Type of Service.
- q. Incoming Electric Service Facilities.
- r. Interruption of Services.
- s. Temporary Electrical Service.
- t. Hazardous Materials.
- u. Operating and Maintenance Manuals.
- v. Record Drawings.
- w. Electrical/Mechanical Sound Control.
- x. Final Acceptance.
- y. Using Agency Instruction.

2. Products:



- a. Vibration Isolators.
  - b. Access Panels.
  - c. Concrete Work.
  - d. Painting.
  - e. Touchup Paint.
3. Execution:
- a. General Installation.
  - b. Electrical Equipment Installation.
  - c. Demolition.
  - d. Existing Panelboards.
  - e. Existing Wiring.
  - f. Equipment Connection.
  - g. Splices.
  - h. Terminals and Connectors.
  - i. Balancing.
  - j. Excavation and Backfilling.
  - k. Field Quality Control.
  - l. Core Drilling.
  - m. Cutting and Patching.
  - n. Cleaning.
  - o. Refinishing and Touchup Painting.
  - p. Mounting Heights.

### 1.3 DEFINITIONS

- A. Provide: The term “provide”, as used in these specifications and on the drawings, shall be understood to mean “the Contractor shall furnish and install, complete and operational, with all required hardware, accessories and appurtenances.” Unless indicated otherwise, this shall also

include all associated power and/or signal wiring required for electrical systems furnished under this Contract.

- B. Concealed: Where the word “concealed” is used in conjunction with raceways, equipment and the like, the word is understood to mean hidden from sight as in chases, furred spaces or suspended ceilings.
- C. Exposed: Where the word “exposed” is used in conjunction with raceways, equipment and the like, the word is understood to mean open to view.
- D. Approved Equal: Where the phrase “or approved equal,” “or equal,” or “approved” appears, it shall refer to the approval of the Engineer on the materials or equipment involved.

#### 1.4 INTENT

- A. Provide complete and fully operational electrical systems with facilities and services to meet all of the requirements described herein and in complete accordance with all applicable codes and ordinances.
  - 1. The manufacturer's recommendations for the particular equipment or system, the National Electrical Code and the Engineer shall determine what is the complete and proper installation and proper operation. The Engineer shall make the final determination.
- B. The drawings are diagrammatic and approximately to scale, unless noted otherwise. They establish scope, material and quality and are not detailed installation instructions.
- C. The Contractor shall be held responsible for proper installation of materials and equipment to true intent and meaning of both Drawings and Specifications.
- D. In cases of discrepancies between the drawings and the specifications, the Engineer will make the final determination. In cases where items appear in the specifications but not on the drawings, or appear on the drawings but not in the specifications they shall be considered as noted on both. Unless written clarification in the form of an addendum is received, the bid shall be interpreted to include the most expensive installation, equipment or work and all associated costs.
- E. The Engineer reserves the right of interpretation of the specifications and drawings. The Engineer's decisions of specification and drawing interpretations shall be final.

#### 1.5 WORK INCLUDED

- A. Refer to Division 1, General Requirements, specification section 01010, Summary of Work for details of work included in project.

#### 1.6 RESPONSIBILITY OF BIDDERS

- A. Examine all contract documents issued. Visit the site and become thoroughly acquainted with the existing conditions prior to submitting a bid. The submission of a bid shall be considered as

evidence that a site visit was conducted; no extra compensation will be allowed for any error resulting from failure to visit job site. Prior to submitting a proposal, bidders must familiarize themselves with the codes, rules, and regulations in effect at the site of the work, to determine existing conditions that affect their installation.

- B. Carefully examine the Architectural, Structural, Heating, Ventilating, Air Conditioning, Plumbing, Fire Protection, and/or Miscellaneous Contract Drawings and Specifications. If any discrepancies occur between the drawings or between the drawings and specifications, report such discrepancies to the Engineer in writing and obtain written instructions as to the manner in which to proceed. Do not make departures from the Contract Drawings without prior written approval of the Engineer.
- C. Execute all work, construct and install all equipment in accordance with the current requirements of all Occupational Safety and Health Administration (OSHA), National Fire Protection Association (NFPA), the National Electrical Code (NEC) as amended to date L&I has adopted, Underwriters Laboratories (UL), National Electrical Manufacturers Association (NEMA), insurance underwriters of the Using Agency and/or other authorities having jurisdiction over premises, public utilities which have connection with any systems specified, and all Federal, State, County and Local ordinances and regulations. Nothing contained in these specifications or shown on the drawings shall be construed to conflict with the aforesaid codes, ordinances, or regulations. Contractor shall be held responsible for accident to persons, material or property caused by failure to adhere to the proper code requirements until the Department has accepted work.
- D. The Contractor shall be qualified or licensed to perform the types of work involved under this Division of the Specifications, in the state, county and/or municipality of this project as required.
- E. Wherever any installation, product, equipment item, etc. specified herein is not permitted to be handled or installed, or is otherwise restricted by union regulations, etc., notify the Department in writing before submitting a bid, in ample time for modifications in the requirements to be made. If such notification is not given, this Contractor shall be responsible to complete the installation as specified, to the Department's satisfaction, and at no additional cost.

## 1.7 QUALITY ASSURANCE

### A. Products Criteria:

- 1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least three years. See applicable specification sections for any additional requirements.
- 2. Equipment Service: Products shall be supported by a service organization that maintains a complete inventory of repair parts and is located reasonably close to the site.
- 3. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
- 4. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.

5. Nameplates: Nameplates bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.

B. Manufacturer's Recommendations: Install materials in accordance with manufacturer's recommendations.

## 1.8 SUBMITTALS

A. General Requirements Applicable to all Divisions 26, 27 and 28 Sections:

1. Submit in accordance with Division 1, Section 01300 and the following:

- a. Prior to ordering equipment, submit to the Engineer a complete list of proposed equipment and materials, giving the name and address of manufacturer and, when required for proper identification, trade names or catalog numbers. Itemize each type of material and each piece of equipment (omitting duplicates).
- b. Submit shop drawings and product data grouped to include complete submittals of related systems, products and accessories in a single submittal. Produce shop drawings to indicate fabrication details and proposed layouts for shop or field fabrications as named herein.
- c. Mark dimensions and values in units to match those specified. Include contract drawing identification, type, quantities, capacities, accessories, rough-in dimensions, manufacturer's name, model number, connection sizes, wiring diagrams, installation instructions, motor horsepower, voltage, phase and amperage, colors, finishes and other pertinent data.
- d. The submissions are the contractor's documents; the Engineer's approval constitutes an acknowledgment that the documents have been submitted and nothing more. It is the contractor's responsibility to check his own submissions for compliance with the Contract Documents, job conditions, and coordination with the work and equipment of the other trades.
- e. Certify, by submittal, that the materials or equipment proposed are satisfactory for the intended application, and that the materials or equipment are in current production with no known plans to cease manufacture.
- f. Submittals processed by the Engineer do not constitute change orders. The purpose of the submittal process is to demonstrate the Contractor's understanding of the design concept; the Contractor demonstrates this understanding by indicating which equipment and materials he intends to provide, and the fabrication and installation methods that he intends to use.

- g. If deviations, discrepancies or conflicts between shop drawing submittals and the contract documents (in the form of design drawings, specifications and addenda) are discovered, either prior to or after shop drawing submittals are processed by the Engineer, the contract documents shall control and shall be followed.
- h. All submittals shall bear the Contractor's approval stamp as evidence that he has checked the drawings. Any submittals without this stamp of approval will not be evaluated and will be returned to the Contractor for proper resubmission. Material and equipment reviews by the Engineer are only for general conformance to the design intent of the project and compliance with information given in the contract documents. Dimensions shall be confirmed and correlated at the job site by the installing Contractor and installation shall be coordinated with other trades.
- i. Coordination composite drawings among the HVAC, Plumbing, Fire Protection, Electrical and Ceiling Contractors are required, with the lead role assigned by the Department. The Lead Contractor shall conduct coordination meetings with all other trades to discuss and resolve interference problems. Once each trade Contractor has initialed the coordination drawings to indicate approval, the Lead Contractor shall submit the drawings to the Engineer for review. The other trade Contractors should finalize their shop drawings in accordance with the coordination drawings, and submit for Engineer's review.
- j. Submit samples of materials for approval at the site as requested by the Engineer. Such materials may be incorporated into the project after approval and serving their purpose as samples.

## 1.9 SUBSTITUTIONS

- A. Submit substitution proposals in accordance with provisions of Division 1 the following:
- B. Throughout the specifications, types of materials may be specified by manufacturer's name and catalog number in order to establish standards of quality and performance and not for the purpose of limiting competition. Unless specifically stated otherwise, assume the phrase "or approved equal", except that the burden is upon the Contractor to prove such equality. If the Contractor elects to prove such equality, he shall request, in writing, review of the substitution by the Department in accordance with all Supplementary Conditions and/or Division 1 requirements. All such requests shall include manufacturer's literature, specifications, drawings, catalog cuts, performance data or other references or information necessary to completely describe the item. The Contractor shall be responsible for all structural, mechanical, and electrical changes required for their installation, at no additional cost to the Department.
- C. A substitution request constitutes a representation that the Contractor:
  - 1. Has investigated the proposed product and determined that it meets or exceeds the quality level of the originally specified product.
  - 2. Will provide the same or greater warranty than the originally specified product.

3. Will coordinate the installation and make changes to all other work including coordination and compensation to other trades that may be required for the substituted product to be installed with no additional cost to the Department.
  4. Waive claims for additional costs or time extensions, which may subsequently become apparent.
- D. When this contractor desires to furnish equipment of a manufacturer other than that specified or intended, he shall include a complete specification of the substituted item, along with each submission copy of shop drawings, indicating the necessary modifications to the substituted product to satisfy the requirements of the contract specifications. Manufacturer's specifications shall be written as close as possible over the contract specifications so that an accurate comparison can be made.
  - E. The verification specification shall include the exact wording of the contract specification and the revised wording, identified properly, indicating all the deviations proposed. If no deviations are noted, the contractor shall furnish the material or equipment in accordance with the contract specifications.
  - F. Substitutions will be considered when a product becomes unavailable through no fault of the Contractor.
  - G. Also, when the contractor submits equipment or materials of the manufacturers specified, verification specifications must be submitted at the request of the Engineer.
  - H. In cases where specific manufacturers are listed, the Engineer reserves the right to consider alternate manufacturers.
  - I. The Engineer reserves the right of final acceptance of substitutions.

#### 1.10 GUARANTEES

- A. Submit equipment warranties in accordance with provisions of Division 1 the following:
- B. Guarantee all equipment, materials, and workmanship for a minimum of one year following date of acceptance of the project. Provide additional/special warranties where called for in the technical specifications.
- C. Warranty shall be in writing and shall include written copies of factory warranties with expiration dates on items of equipment where warranty date might differ from the acceptance date. No warranty shall start before date of acceptance in writing by the Department. Repair or replace any defective work developing during this period, at no additional cost. Where defective electrical work results in damage to work of other contracts, this contractor shall be responsible to repair and/or restore such work to its original condition, again at no additional cost to the Department.
- D. The equipment and materials manufacturers are expected to recognize that they are responsible for the failure of their products to perform in accordance with data furnished by them or their authorized representatives, as well as misrepresentations of such data. If the products have been

installed in accordance with the manufacturers published or written instructions and recommendations, and such products fail, then the Contractor and the manufacturers are responsible for replacement of the products and all associated work and materials, at no cost to the Department.

#### 1.11 REGULATIONS

A. All electrical work, equipment and material furnished or installed under this contract shall conform to requirements of the latest codes and any other Governmental or Local Authorities having jurisdiction and of all rules and regulations of Utilities involved. Nothing mentioned in the specifications or indicated on the drawings shall be construed to conflict with mentioned codes, ordinances and regulations. The following codes shall be followed:

1. Pennsylvania Uniform Construction Code (UCC)
2. National Electrical Code (NFPA 70)
3. National Electrical Safety Code (NESC-ANSI-C2)
4. Life Safety Code (NFPA 101)
5. National Fire Alarm Code (NFPA 72-2008)
6. International Code Council Series (ICC-2009)
7. Pennsylvania Department of Environmental Protection (DEP)
8. Pennsylvania Department of Labor and Industry (L&I)
9. Americans with Disabilities Act (ADA)
10. Occupational Safety & Health Agency (OSHA)
11. Applicable utility company rules and regulations.
12. Applicable Federal, State, and Local (or any other authority having jurisdiction) laws, rules and regulations.

#### 1.12 STANDARDS AND REFERENCES

A. Products of workmanship that are specified by association, trade, or federal standards shall comply with the requirements of the following reference standards, except when more rigid requirements are specified or are required by applicable code:

1. American National Standard Institute (ANSI)
2. American Society for Testing and Materials (ASTM)
3. Factory Mutual System (FM)

4. Institute of Electrical and Electronics Engineers (IEEE)
5. Illuminating Engineering Society of North America (IESNA), Lighting Standards and Recommended Practices
6. National Electrical Manufacturers Association (NEMA)
7. National Fire Protection Association (NFPA)
8. Underwriters Laboratories, Inc. (UL)
9. Updated Standards: At the request of the Engineer, Contractor or governing authority, submit a change order proposal where an applicable industry code or standard has been revised and reissued after the date of contract documents and before performance of the work affected. The Engineer will decide whether to issue a change order to proceed with the updated standard.

#### 1.13 PERMITS AND INSPECTIONS

- A. Refer to Division 1 – General Requirements.

#### 1.14 PROJECT/SITE CONDITIONS

- A. Refer to Division 1 - General Requirements.
- B. Install work in locations shown on the drawings, unless prevented by project conditions
- C. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of the Engineer before proceeding.
- D. Perform all minor cutting and patching, and make all changes, relocations and installations with a minimum of noise. All present and new equipment, floors, walls, etc., shall be adequately protected from dust and dirt caused by the work. Protection shall include suitable temporary barriers or coverings. Maintain exterior and interior premises of the building as clean as possible during construction. At no time shall the Contractor interfere with the normal operation of the building by allowing debris, excess earth, etc., to remain on the premises.

#### 1.15 DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 - General Requirements.
- B. Deliver materials and equipment to the project site in a clean condition with openings plugged or capped (or otherwise sealed by packaging) both during shipping and during temporary storage. Deliveries shall be scheduled to minimize the amount of time in temporary storage.



- C. Delivered equipment crating and/or packaging shall clearly identify pick points or lifting points. In the absence of crating or packaging, pick points or lifting points must be identified on the equipment.
- D. When unloading material and equipment, provide special lifting harness or apparatus as required by the manufacturer. Handle materials and equipment in accordance with manufacturer's written instructions.
- E. Determine the required equipment needed for unloading operations and have such equipment on site to perform unloading work on the date of equipment delivery.
- F. Store materials on site only where directed by the Department. Materials and equipment, both on site and off site, shall be stored in accordance with manufacturers written instructions. Store all materials in dry locations, off ground and keep moisture free at all times.
- G. The Contractor shall protect at his own expense, his work, materials, and equipment during construction. Units and devices, both before and after being set in place, shall be securely protected from carelessly or maliciously dropped tools, materials, grit, dirt or any foreign matter. Contractor shall be held responsible for damage so done until work is fully and finally accepted.
- H. The Contractor shall be entirely responsible for all apparatus, equipment and appurtenances furnished by him or his subcontractors in connection with the work, and special care shall be taken to protect all parts thereof in such manner as may be necessary or as may be directed. Protection shall include covers, crating, sheds or other means to prevent dirt, grit, plaster, or other foreign substances from entering the working parts of machinery or equipment. Where equipment must be stored outside the building, it shall be totally covered and secured with heavy, waterproof tarps and kept dry at all times. Where equipment has been subjected to moisture, it shall be suitably dried out before placed in service. Materials and equipment shall be stored in areas designated by the Department.
- I. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products and equipment to assure that they are being maintained under specified conditions, and free from damage or deterioration.

#### 1.16 PROTECTION OF SERVICES AND EQUIPMENT

- A. This Contractor shall, at his own expense, repair, replace and maintain in service any utilities, facilities or service (underground, overhead, interior or exterior) damaged, broken, or otherwise rendered inoperative during the course of construction by him or his representatives. The method used by this Contractor in repairing, replacing or maintaining the services shall be approved by the Department.

#### 1.17 SEQUENCING, SCHEDULING AND COORDINATION

- A. Refer to Division 1 - General Requirements.

- B. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
  - 1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces.
- D. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
- E. Interference:
  - 1. The drawings are generally diagrammatic and indicative of the work. The Contractor is responsible for modifying the work with offsets, bends, or other fittings to avoid minor interference's and structural obstructions. Perform such modifications at no increase in cost to the Department.
  - 2. In the event that interferences develop, the Engineer's decision will be final and no additional compensation will be allowed for relocation of electrical equipment.
- F. Contract Interface:
  - 1. Work performed in cooperation with other contracts: The responsibility for performing work of this contract in cooperation with work of other contracts rests solely with this Contractor.
    - a. Make connections of electrical systems specified in the various sections of this contract to those systems or installations of other contracts requiring such connections.
    - b. These connections are generally indicated as contract breaks on the drawings.

#### 1.18 TYPE OF SERVICE

- A. Existing Electric Service shall remain: - 120/240V-3 phase, 4 wire (High-Leg), 800A, 60 HZ, alternating current.

#### 1.19 INCOMING ELECTRIC SERVICE FACILITIES

- A. Provide all electrical facilities as shown on the drawings, hereinafter specified or as required for maintaining the existing electric service entrance during construction.

1.20 INTERRUPTION OF SERVICES

- A. Refer to Instruction to Bidders of the Contract.
- B. At beginning of the project, review the procedures of the Using Agency relating to utility interruptions and plan the electrical work accordingly. Develop a preliminary utility interruption schedule and submit to the Using Agency for approval before developing final project schedules.
- C. Schedule the work to avoid major interruptions of any utility services. Interruption of services shall be done during overtime if necessary at no additional cost to the Department.
- D. Notify the Using Agency in writing a minimum of five working days prior to any interruption of services.

1.21 TEMPORARY ELECTRICAL SYSTEMS

- A. Refer to Division 1 - General Requirements.

1.22 HAZARDOUS MATERIALS

- A. Should hazardous or toxic materials be encountered in any existing work, the Contractor shall notify the Department.

1.23 OPERATING AND MAINTENANCE MANUALS

- A. Submit under provisions of Division 1 and in accordance with the following:
- B. Provide heavy-duty catalogue binders with appropriate labeling.
- C. Binder shall be indexed by material and/or system type and at a minimum shall include:
  - 1. Title page with clear plastic protection cover.
  - 2. List of Drawings.
  - 3. Description of Systems: Provide complete and detailed description of systems.
  - 4. Operating Division: Provide complete and detailed operation of major components.
  - 5. Maintenance Division: Provide preventative maintenance schedule for major components.
  - 6. List of Equipment Suppliers and Contractors: Provide list of equipment suppliers and contractors, including address and telephone number.
  - 7. Certification: Include copy of tests performed on insulation, grounding, continuity, phase balancing and signal systems; electrical equipment tag identification and wiring color

code; inspection approval certificates for electrical systems and operational tests on applicable electrical equipment.

8. Shop Drawings and Maintenance Bulletins: Provide materials received in compliance with clause 'Shop Drawings', arrange alphabetically.

D. Divider Tabs: Laminated Mylar plastic and colored according to Section.

E. Submit documents for approval prior to being turned over to the Using Agency.

#### 1.24 RECORD DRAWINGS

A. Submit under the provisions of Division 1 and in accordance with the following:

B. Keep on site at all times an extra set of drawings and specifications recording changes and deviations from contract documents including all addendum, bulletin and request for information data. Documents shall be updated on a daily basis. This set of documents shall be used specifically for this purpose.

C. The record drawings shall accurately reflect the as-built conditions at the time of the project completion.

D. Record drawings shall be presented with maintenance manuals to the Department at the time of final acceptance of the project.

#### 1.25 ELECTRICAL/MECHANICAL SOUND CONTROL

A. All equipment shall operate without objectionable noise or vibration within Noise Criteria Curves listed in Sound Control Fundamentals of the latest edition of the ASHRAE Handbook of Fundamentals. Sound and vibration measurements shall conform to the ASHRAE Handbook of Fundamentals. If such objectionable noise or vibration shall be produced and transmitted to occupied portions of the building by electrical/mechanical equipment (i.e. generators, transformers, etc.) or other parts of this work, any necessary changes, as approved shall be made without additional cost to the Department. Noise levels shall conform to the requirements of OSHA.

B. Any and all other insulation or isolation required to accomplish results specified above shall be furnished and installed without additional cost to the Department.

C. Isolation systems shall be installed in strict accordance with the manufacturer's written instructions and submittal data. Locations of all vibration isolation products shall be selected for ease of inspection and adjustment, as well as for proper operation.

D. No rigid connections between equipment and building structure shall be made that degrades the noise and vibration isolation system herein specified. Electrical conduit connections to isolated equipment shall be looped to allow free motion of isolated equipment.

1.26 FINAL ACCEPTANCE

- A. Refer to Division 1 - General Requirements.
- B. When the installation is reported in writing by the contractor to be complete and ready for acceptance, an inspection shall be made by the Contractor in the presence of the Department to ascertain whether it complies with the contract documents. If in the opinion of the Department it fails to do so, the Contractor shall at once remedy all defects and shortcomings. Any additional tests that may be required shall be entirely at the Contractor's expense. All of the testing work shall be done when and as directed by the Department.

1.27 USING AGENCY INSTRUCTION

- A. The Contractor shall furnish the services of qualified personnel, approved by the Engineer and thoroughly familiar with the completed installation, to instruct the permanent operating personnel of the Using Agency in the proper operation of all systems included under this contract, and the proper care of all equipment and apparatus. These services shall be furnished for a period of one 8-hour day, after the operation of the systems has been taken over by the Using Agency.
- B. When instructions are provided under this contract, the Contractor shall have in his possession three copies of an identifying letter which shall list the names of the Contractor's qualified instruction personnel, including manufacturers' representatives and subcontractors that will be giving the instructions. Likewise, on this same letter, spaces shall be provided for the personnel of the Using Agency who will receive the instructions. After instructions have been given and received for each system, the Contractor's representatives and subcontractors shall sign and date the letter, and the Using Agency personnel attending shall sign and date the letter acknowledging that they have received adequate instructions for operating and maintaining the systems and equipment. One signed copy shall be delivered to the Using Agency, one copy to the Department and one copy shall be retained by the Contractor.
- C. In addition to the verbal instructions outlined above, the Contractor and his manufacturers' representatives and subcontractors shall furnish written basic instructions indicating the proper operation of each system and associated equipment. Each manufacturer shall also submit a brochure on his equipment, including instructions on operation, recommended spare parts, and instructions on preventative, routine and breakdown maintenance.
- D. The Contractor shall combine the written instructions and the manufacturers' equipment brochures in complete volumes with hardback binders which shall be turned over to the Using Agency before final acceptance of the contract work. The Contractor shall obtain two copies of a signed receipt from the Using Agency for the written instructions and equipment brochures. One copy of the receipt shall be delivered to the Engineer and one copy retained by the Contractor.

## PART 2 - PRODUCTS

### 2.1 VIBRATION ISOLATORS

#### A. Neoprene Isolation Pads:

1. Neoprene isolation pads shall be single rib or crossed, double rib neoprene in shear pads, in combination with steel shims when required, having minimum static deflections as tabulated. All neoprene pads shall be true neoprene in-shear using alternately higher and lower ribs to provide effective vibration isolation, and shall be molded using 2500 psi tensile strength, oil resistant, compounds with no color additives. Pads shall be 45 or 65 durometer and designed to permit 60 to 120 psi loading, respectively, at maximum rated deflections. Neoprene in-shear isolation pads shall be provided to meet tabulated minimum operating static deflections without exceeding published maximum static deflections. Use single or, crossed, double rib or laminated composites of both as required. When two pads of ribbed material are laminated, they shall be separated by, and bonded to, a galvanized steel shim plate.

### 2.2 ACCESS PANELS

- A. Furnish factory-fabricated access panels for access to all concealed pull boxes, junction boxes, capped conduits and other electrical equipment where no other means of access is available. Access panels for electrical work, along with all required auxiliary or supporting steel, hardware, etc., shall be furnished by the electrical contractor to the general contractor, who shall install them. Access panels are not required at lift-out removable tile ceilings.
- B. Access panels shall be of appropriate size but not less than 16" x 12". Panels shall be all steel construction with a #16 gauge wall or ceiling frame and a #14 gauge panel door. Doors shall be provided with concealed hinges and cylinder lock except doors for wall panels which may be secured with suitable clips and countersunk screws. Outside of access panels shall be finished flush with finished walls or ceilings surfaces and shall be prime painted.
- C. At locations where access panels are installed in fire-rated ceilings, access panels shall contain the 1-1/2" hour fire-rated "B" label, and, in addition, shall also be provided with layers of gypsum wallboard in a thickness which will supply an additional one-hour fire rating. Consider all ceiling access panels required in gypsum board or plaster ceilings to be 1 hour rated unless otherwise noted on the Architectural drawings.
- D. Determine the exact locations and sizes of required access panels and coordinate same with the Department. Access panels shall not be installed without prior approval of the Department. All panels shall be installed and located to present a neat and symmetrical appearance.
- E. Junction boxes, capped conduits and other electrical equipment above removable tile ceilings or above panels shall be suitably identified by small, inconspicuous adhesive-backed labels attached to the ceiling surface or the surface of the access panel. Labels shall be additionally secured with screws or rivets. Labels shall be white with 3/8" high black letter and shall be a manufactured item for that purpose.

## 2.3 CONCRETE WORK

- A. Refer to Division 3 – Cast-In-Place Concrete.
- B. This Contractor shall provide all concrete for equipment foundations, duct-banks and patching as specified or otherwise required for completion of work.
  - 1. Concrete for equipment foundations and pole bases shall be Pennsylvania Department of Transportation, Class A, rated 4000 pounds/square inch at twenty-eight (28) days. Equipment foundations shall be properly dwelled in with floor construction, and shall have slopped bevels on all horizontal and vertical edges. Foundations shall be 4” high, unless otherwise indicated. Foundations shall be reinforced with 6”x 6” #10 gauge wire mesh and anchored through floor construction with ¾” diameter bolts or rods. Anchor bolts for equipment shall be placed in foundations before equipment is set. Foundations shall be of sufficient size for equipment and shall extend a minimum of 4” beyond equipment on all sides.
  - 2. Concrete for conduit encasement shall be Pennsylvania Department of Transportation Class A, rated 3,300 pounds/square inch at twenty-eight (28) days.
  - 3. All concrete shall be obtained from an approved source. Concrete testing is not a requirement, however, batch slips shall be given to the inspector for checking.
  - 4. All concrete shall be 6% air entrained and the slump of concrete shall not exceed three inches. All concrete shall be thoroughly compacted by the use of mechanical vibrators.
  - 5. All work associated with the handling, placing of reinforcing steel and curing shall be done according to the recommendations of the American Concrete Institute and Concrete Reinforcing Steel Institute, and all materials shall conform to the American Society for Testing Materials Specifications, applicable to this work.
  - 6. To insure adequate curing, do not remove forms from vertical surfaces for five (5) days after casting unless other approved means are taken to prevent premature drying of concrete. Keep all horizontal surfaces continuously wet for seven (7) days with mechanical sprinklers or coat with an impervious sealer, applied in atomized form at a rate of not less than one (1) gallon per two hundred square feet after surface water has entirely disappeared, but while surfaces are still moist. This compound shall form an effective seal which will prevent evaporation of moisture from concrete for the full curing period, and shall be used in strict accordance with the manufactures published recommendations.
  - 7. Provide adequate equipment for heating the concrete and protecting the concrete during freezing or near freezing weather. All concrete materials, reinforcement, forms and ground with which the concrete will come in contact shall be free of frost.
  - 8. After the first frost and until the mean daily temperature at the site falls below 40 degrees for more than one (1) day, protect concrete from freezing for not less than the first forty-eight (48) hours after it is placed. When the mean temperature falls below 40 degrees for more than one (1) day, place concrete thereafter at a temperature not lower than 55 degrees and not higher than 70 degrees, and maintained not lower than 55 degrees for at least the first three (3) days. During the next three (3) days protect from freezing. When

the mean daily temperatures rise above 40 degrees for more than three (3) successive days, placement and maintenance of concrete for three (3) days at or above required minimum temperatures may be discontinued, but concrete should not be exposed to freezing temperatures for at least forty-eight (48) hours after placing.

## 2.4 PAINTING

- A. This Contractor shall paint all exposed raceways, hangers, junction boxes, etc., that this Contractor installs in finished areas. Finished areas shall be those areas where the surfaces are plastered, glazed tile, painted block, etc. This Contractor is not responsible for any other painting except as otherwise noted.
- B. Where the Contractor is the only Contractor working in a specified area, he shall be responsible for painting equipment and related raceway, if classified a finished area.

## 2.5 TOUCH-UP PAINT

- A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.
- B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.
- C. Panelboard trims and doors, safety switch and circuit breaker enclosures, and items of similar nature shall be baked enamel finished at the place of manufacture. Damage to the factory finish due to shipment or installation shall be "touched-up" by this Contractor with factory supplied paint

## PART 3 - EXECUTION

### 3.1 GENERAL INSTALLATION

- A. All work shall be installed in a neat and workmanlike manner by craftsmen experienced in the trade involved and shall be acceptable to the Department. All details of installation shall be mechanically and electrically correct. All materials and equipment shall be new, and without imperfections or blemishes, unless otherwise noted. Before ordering any material or doing any work, the Contractor shall verify all measurements at the site and shall be responsible for the correctness of same.
- B. The Contractor shall lay out his work from dimensions of bid documents, actual dimensions taken at the site, and from the approved dimensions of equipment being installed. Layouts in congested areas should not be scaled from the electrical and mechanical drawings. No extra compensation will be allowed on account of difference between actual dimensions and measurements and those indicated on the drawings. Any difference, which may be found, shall be submitted to the Department for consideration before proceeding with the work.
- C. This specification includes under each item all labor, material and equipment necessary to properly install complete, adjust, and place in operating condition, satisfactory to the Department, the several branches of work described herein. This shall include all necessary



interconnections between the several branches of work described herein, and connections to work under other sections of specifications and other contractors.

- D. All items of labor, material or equipment not described in detail by specifications or drawings, but which are incidental to or necessary for complete installation and proper operation of several branches of work described herein, or reasonably implied in connection therewith, shall be furnished and/or installed as if called for in detail by drawings or specifications.
- E. The drawings are generally indicative of the work required and shall be followed as closely as circumstances will permit, however they do not indicate all bends, fittings, boxes and accessories which may be required. The Contractor shall carefully investigate structural and finish conditions affecting work and arrange work accordingly, furnishing such fittings, accessories, etc., required to meet such conditions. Contractor will be held responsible for proper installation of materials and equipment to the true intent and meaning of contract documents.
- F. The Contractor shall carefully examine all contract documents including those of all other trades, and carry on his work so as not to delay or interfere with the work of other trades. He shall obtain in writing from the other contractors such data as is necessary to coordinate his work with other trades.
- G. The drawings indicate approximate location of wiring, outlets, equipment, etc., and the actual location shall be confirmed at the site with the Department. The department reserves the right to make minor changes in the locations of conduits, outlets, equipment, etc. prior to roughing-in, without incurring additional expense to the Department.
- H. Coordinate location of luminaires, conduit, wire, wiring devices, equipment, etc., to be clear of windows, doors, openings, diffusers, return grilles, sprinklers and other services and utilities. This Contractor shall be held responsible to coordinate his work with that of the other trades so that all work may proceed in an orderly manner and conflicts and delays may be avoided. Where drawings indicate special space allocation for different contracts, contractors shall rigidly adhere to sequence of installation designated by the Department or as required to allow all the trades to work equipment or materials into place in respective order. Special attention shall be paid to work under the floor slabs, above ceilings and in locations otherwise concealed. All work shall be tested before it is closed in.
- I. Secure dimensions of all recessed lighting fixtures, telephone, data and similar device outlets and other equipment immediately upon the award of the Contract. Work closely with the General, HVAC, Plumbing and other Contractors and provide them with the necessary information and dimensions so that there will be no interference between piping, duct work, structural steel, furring channels, etc., and recessed lighting fixtures or other electrical equipment.
- J. In case interference or fouling results, the Department shall decide which item is to be relocated, regardless of which is installed first. The Contractor shall receive no additional compensation for relocating items that result from interference with other work.
- K. Contractor shall determine in advance, location and size of chases and openings necessary for proper installation of his work, and have same provided during erection of work in which chases and openings occur. He shall furnish and set sleeves, hangers, and anchors, and be responsible for their proper and permanent location.

- L. In cases where cutting of new building construction is necessary due to failure to set proper sleeves or inserts, or due to the failure to provide proper openings and chases such cutting shall be done and repaired to match the original condition of the work by the contractor under this specification.
- M. Points of connection and termination of work under this specification are shown on drawings or stated within the specification, but in case of doubt as to such points, the Department's decision will be final.
- N. Follow manufacturer's published recommendations for installation methods not otherwise specified. The Contractor shall furnish the services of manufacturer's representatives for each piece of major equipment furnished under these contract documents. The amount of factory service provided by the contractor shall be as normally recommended and furnished by the various equipment manufacturers unless specified otherwise. Testing of equipment shall be made under the direct supervision of competent authorized service representatives. Any and all expenses incurred by the equipment manufacturers' representatives shall be borne by the contractor.
- O. Contractor shall seal all openings left in building construction by the installation of work specified under this section. Sealing shall be in accordance with "Cutting and Patching" section specified herein.
- P. Where the vapor barrier of any insulation is broken due to the installation of conduit and equipment, the Contractor shall properly repair all insulation and seal all openings with vapor barrier covering and vapor barrier adhesive of type installed with the insulation.
- Q. Upon completion of the work, all remaining waste materials and rubbish resulting from the contract work shall be removed from the building and premises.
- R. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Department for clarification. Do not proceed with work without clear instructions.
- S. The Contractor and his subcontractors shall satisfactorily complete the systems so that they are functional and operating to the satisfaction of the Department. All systems, their controls and their sequencing must be demonstrated to the satisfaction of the Department.

### 3.2 ELECTRICAL EQUIPMENT INSTALLATION

- A. Headroom Maintenance: If mounting height or other location criteria is not indicated, arrange and install components and equipment to provide the maximum possible headroom.
- B. Materials and Components: Install level, plum, parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components.
- D. Connect for ease of disconnecting, with the minimum interference with other installations.
- E. Right of Way: Give to raceways and piping systems installed at a required slope.

### 3.3 DEMOLITION

#### A. Existing Equipment:

1. To accommodate the renovations, disconnect and remove or relocate existing equipment and services as indicated on the plans or as required (whether or not the existing equipment is shown on the drawings). All other existing equipment shall be removed, unless otherwise noted.
2. If new equipment such as receptacles, light fixtures, etc. is to be installed where an existing device is located, the existing outlet box may be reused if it complies with all applicable codes.
3. All existing building equipment to be removed that would be of some value to the Using Agency, such as light fixtures, time clocks, safety switches, panelboards, etc., shall be removed by this Contractor and turned over to the Using Agency for storage.
4. It is this Contractor's responsibility to pay disposal fees for equipment removed. Equipment shall be disposed of in accordance with governing environmental regulations (i.e. ballasts, lamps, transformers, batteries, etc.).

#### B. Removal of Existing Circuits:

1. Where it is noted for switches, receptacles, fixtures or other electrical equipment to be disconnected and removed; it shall be understood that all wiring, junction boxes, supports, appurtenances and accessories associated with the equipment (not required to remain, due to continuity or other necessity) shall be removed in their entirety.

#### C. Extension of Existing Circuits:

1. Where existing equipment is indicated as being relocated and a circuit connection is not shown or noted, this Contractor shall extend and connect the existing circuit as required.
2. In areas where the general construction work interrupts the continuity of an existing circuit, this Contractor shall relocate portion of the circuit required to maintain continuity.

#### D. Coordination: Coordinate all demolition work with the other trades and the Department.

### 3.4 EXISTING PANELBOARDS (Where Applicable)

#### A. Existing panelboards to remain or to be relocated:

1. Clean interiors and exteriors.
2. Inspect for damage. Notify Engineer if repairs are necessary or damaged components need replacing.
3. Tighten conduit and wire terminations in accordance with applicable codes.

#### B. Verify panelboards and panelboard feeders are of adequate capacity for loads to be served.

1. Activate loads connected to panelboards to achieve full load condition.
  2. Measure and record amperage readings of phase and neutral conductors of panelboard feeders.
  3. Provide typewritten report of recorded measurements to the Engineer for review.
- C. Provide new typewritten circuit directory.
- D. New circuit breakers for existing switchboards, panelboards or loadcenters shall match the existing circuit breaker type, manufacturer, and AIC rating. If the existing breaker type is no longer available, submit proposed substitution to Engineer for approval.

### 3.5 EXISTING WIRING

- A. Inspect existing wiring which is to be disturbed for damage. Repair or replace damaged wiring.
- B. Insure integrity of existing wiring insulation:
1. Megger wiring phase-to-phase, phase to neutral, phase to ground, and neutral to ground.
  2. Record megger results. Provide typewritten report of results to the Engineer for review.
  3. Repair defective insulation to a dielectric value equal to that of wire of the same type and age.
- C. Secure and label existing wiring which is to be disturbed.
- D. Tighten existing wiring terminations and connections in accordance with applicable codes.

### 3.6 EQUIPMENT CONNECTION

- A. Refer to Section 260510, Electrical Equipment Wiring, for mechanical equipment wiring requirements.
- B. Terminate all circuits feeding equipment or furniture in safety switch, receptacles or outlet as shown on the drawings or as directed by the Department.
- C. Each piece of equipment requiring electric service shall be provided with a finished outlet.
- D. Make final connections to each piece of equipment requiring electric service.
- E. The drawings show generally the location of electric service to each piece of equipment. However, this contractor shall secure detailed shop drawings showing dimensioned locations for electric service to each piece of equipment from various contractors supplying such equipment prior to roughing-in.
- F. This contractor will be required to relocate any misplaced outlet at his own expense if he fails to secure detailed shop drawings prior to roughing-in for equipment.

### 3.7 SPLICES

- A. Splices shall be made with approved type solder-less connectors of the insulated type. However, at locations where the non-insulated type are used, they shall be covered with rubber and friction tape to the same thickness as the original insulation of the wire used. Solder-less connections shall be as manufactured by AMP Incorporated, Thomas & Betts, Burndy or approved equal.

### 3.8 TERMINAL AND CONNECTORS

- A. All lugs, terminal blocks, etc. for panelboards, enclosed circuit breakers, switches, control centers, etc., shall be standard product as manufactured by AMP Incorporated, Thomas & Betts, Burndy or approved equal.

### 3.9 BALANCING

- A. Each system of feeder and branch circuits for power and lighting shall be connected to panelboard buses in such a manner that loads connected thereto will be balanced on all phases as closely as practicable. Should there be any unfavorable condition of balance on any part of the electrical system, the Electrical Contractor shall make changes to the electrical system that may be required by the Department to remedy the unbalanced condition. Should there be an unbalance on existing equipment, not included under this contract, the contractor shall report the unbalance to the Department so that the condition may be corrected by the Department under a separate contract. Before final acceptance by the Department, the contractor shall submit readings of all phase legs at each panel with the lighting and power circuits "on". All conductors for the system shall be connected in strict accordance with the requirements of the National Electrical Code.

### 3.10 PIPE CURBS; EQUIPMENT SUPPORTS AND FLASHING

- A. Coordinate installation of curbs, equipment supports, and flashing with the roofing work.
- B. Minimum curb and support height shall be 12 inches.
- C. Flash and counter flash where electrical conduit and equipment passes through weather or waterproofed walls, floors and roofs.

### 3.11 EXCAVATION AND BACKFILLING

- A. Refer to Division 31 for requirements.
- B. The contractor shall do all necessary excavating of widths and to depths required for the installation of manholes, box pads, concrete foundation slabs, for the installation of underground duct banks, and for the installation of other equipment and materials as shown on the drawings and herein specified.
- C. Final grading, finishing, paving and seeding at all excavated areas shall be included under this contract, except where new surfaces are being provided as a part of the site work under the

General Contract. The Electrical Contractor will be responsible for all backfilling and paving of roadways, sidewalks and other paved areas associated with this contract. All surfaces shall be restored to the satisfaction of the Department.

- D. Prior to submitting his bid price and prior to any work, the Electrical Contractor shall familiarize himself with local ordinances and amendments and shall contact the appropriate authorities to obtain all regulations and requirements that must be followed. The contractor shall secure all necessary permits before the start of any work.
- E. Conform to Act No. 287 of the General Assembly of the Commonwealth of Pennsylvania that was enacted to protect the public health and safety.
- F. The bottoms of all excavations shall be properly leveled off and concrete placed on undisturbed soil. All loose materials shall be removed and the excavations shall be brought into approved condition to receive concrete or other material. No earth filling shall be allowed under any bases or slabs. All excavation shall be carried down to firm formation. However, if additional depths are required to reach firm earth, the extra excavation and materials required to perform the work shall be done at no extra cost to the Department. If, through an error on the part of the contractor, any part of the excavation is carried below the depth indicated or required for the work, the contractor shall maintain the excavation and shall start concrete from the excavated level, and no extra compensation will be considered. Excavate and pour concrete only on the basis of approved shop drawings. Excavation below footings shall be filled with concrete as directed by the Department.
- G. Notify the Department as soon as excavations are completed, in order that the bearing quality of the bottoms may be inspected before concrete is poured, or before formwork is erected. Concrete shall be poured as soon as weather conditions permit after excavation is completed and inspected. In case bottoms of excavations become wet and soft, all soft material shall be removed and the concrete poured to the required extra depth, at no extra cost to the Department.
- H. Minimum cover for the various lines shall be not less than indicated on the drawings, but not less than local regulations and practice. Generally, piping shall be installed with not less than 3'-0" cover.
- I. The width of all trenches shall be not less than widths shown on the drawings or required to install piping and materials.
- J. The excavation shall be kept safe at all times. Shoring and sheathing shall be used when necessary. The excavation shall be kept free of water at all times. Additional shoring and sheathing may be ordered at any time to safeguard the work. Shoring and sheathing shall be provided in strict accordance with all applicable State, county and local ordinances and regulations.
- K. All excess excavated materials shall be disposed of as directed by the Department. The number of points at which the contractor will be permitted to work and length of open trenches that will be permitted will be governed by the Department.
- L. No existing asphalt or concrete paving shall be buried or otherwise disposed of on the site. It shall be disposed of off-site, by the contractor, in a manner consistent with applicable laws and regulations.

- M. To protect persons from injury and to avoid property damage, adequate barricades, construction signs, torches, red lanterns, and guards shall be placed and maintained during the progress of construction, and until it is safe for traffic use. Rules and regulations of the local authorities respecting safety provisions will be observed.
- N. Adequate protection shall be provided for all new or existing structures, services, or utilities encountered in the excavation. The protection shall include bracing, sheathing, supports, etc., as required to maintain grade and alignment and to provide proper mechanical strength. Any structures, services, or utilities damaged by the work of the contractor shall be promptly repaired and replaced in same condition as they originally were prior to such damage.
- O. Any existing services, utilities or other obstructions no longer required, shall be removed where encountered during the excavation.
- P. Excavation shall be conducted in a manner to cause the least interruption of traffic. Where traffic must cross open trenches, the contractor shall provide bridges suitable for the traffic involved.
- Q. The proposal shall include all excavation that may be necessary to complete the project, including any rock that may be encountered. No blasting of any kind will be permitted on the interior or exterior of the building.
- R. After the pipe or equipment has been laid, tested, inspected and concrete has been poured, cured and inspected, the excavation shall be backfilled by the contractor with the best carefully selected materials free from stones, large pebbles, hard lumps or frozen earth. The backfilling shall be placed in horizontal layers not to exceed 6" in thickness and each layer shall be thoroughly consolidated and compressed with pneumatic rammers. No backfilling shall be done until all undermined earth has been broken down and the sides of the excavation made vertical or inclined outward. New backfill shall be obtained on the site where necessary and where directed by the Department, or where necessary, backfill shall be hauled from off-site locations at no additional cost to the Department.
- S. Restore the surfaces of all excavations to their original condition. This shall include existing or new paved or unpaved streets, parking areas, driveways, sidewalks, and turf. Existing trees, shrubs, or turf damaged under this contract shall be replaced to the satisfaction of the Using Agency and the Department.
- T. As the work progresses, record on the drawings all changes and deviations from the contract drawings. Measurements shall include elevations and sufficient offset measurements from building to definitely locate all equipment and underground lines. Two prints of the marked drawings shall be delivered to the Department before final acceptance.
- U. Any settling, deterioration or washing out of earth or repaired surfaces after initial installation shall be corrected by this contractor.

### 3.12 FIELD QUALITY CONTROL

- A. Inspect installed components for damage and faulty work, including the following:
  - 1. Supporting devices for electrical components.

2. Concrete bases.
  3. Electrical demolition.
  4. Cutting and patching for electrical construction.
  5. Touchup painting.
- B. This Contractor shall furnish the services of an experienced superintendent who shall be constantly and continuously in charge of the installation of work.
- C. The quality of the workmanship required for this trade in the execution of its work shall be of the finest and highest obtainable in that trade working with materials specified. Workmanship shall be accomplished to the satisfaction of the Department.

### 3.13 CORE DRILLING

- A. This Contractor shall core drill holes associated with new feeders and branch circuits as indicated on the drawings.
- B. All core drillings shall be fire stopped/sealed after installation of conduits as hereinafter specified.
- C. This Contractor shall cover all equipment on the floor below core drillings. Any water or other damage shall be the responsibility of this Contractor to repair or replace without additional expense to the Department.

### 3.14 CUTTING AND PATCHING

- A. Refer to Division 1 - General Requirements.
- B. This Contractor shall be responsible for all cutting, patching, and finishing of existing construction for the proper installation of all electrical equipment and materials to be installed in the building. This will also be required for the removal of the existing equipment and materials. All cutting shall be kept to a minimum consistent with the requirements of the project. Cutting, patching, and finishing shall be done by workmen skilled in this type of work. All patching shall be done utilizing materials of the same quality and texture as the adjacent undisturbed areas perfectly and to the satisfaction of the Department. Painting of the final disturbed areas, where general construction work occurs, will be the responsibility of the General Contractor, unless otherwise indicated. Painting of the final finished areas, where no general construction work occurs, shall be by this Contractor. Be it walls or ceilings, paint entire plane in which damage occurs.
- C. No cutting shall be done which may affect the building structurally or architecturally without first securing the approval of the Department. Cutting shall be accomplished in such a manner as not to cause damage to the building or leave unsightly surfaces, which cannot be concealed by plates, escutcheons or other construction. Where such unsightly conditions are caused, this Contractor shall be required, at his own expense, to repair the damaged areas.



- D. Where openings are to be made in existing roof, obtain bonding company approval, if roof bond is still in effect, before such openings are made. Perform finishing and roof flashing, in areas of existing building or roof not being disturbed under general construction, for installation of work under Divisions 26, 27 and 28.
- E. Cutting of the construction excessively or carelessly done shall be repaired by this Contractor to match the original work and to the satisfaction of the Department who will make the final decision with respect to excessive or careless cutting work.
- F. This Contractor shall seal all openings he has made in plenum spaces, fire rated floors, ceilings or partitions after his work has been installed. The materials used for sealing the openings shall have a fire rating equal to or greater than the rating of the floor, ceiling or partition material.
- G. Where present equipment is removed and unused openings remain in walls, floors, partitions, etc., this Contractor shall properly patch all such openings. All patching and repairing shall be done by workmen skilled in this type of work and shall match present or new finishes.

### 3.15 CLEANING

- A. Refer to the Instructions to Bidders of the Contract.
- B. Prior to painting, clean as required to remove plaster, dirt, grease, dust, labels, burrs, etc.
- C. Prior to final inspection, the Contractor shall clean all equipment and surfaces within the scope of the project (for example: lighting fixtures, switch and receptacle plates, engine generators, electrical distribution equipment, etc.). In addition, the Contractor shall clean anything else that requires cleaning as a result of the Contractor's work.
- D. Any damage in the electrical system or other damage to any part of the building, its finish or furnishings, due to failure to properly clean electrical equipment and or associated components, shall be repaired by the Contractor with no additional cost to the Department.

### 3.16 REFINISHING AND TOUCH UP PAINTING

- A. Refinish and touch up paint.
  - 1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
  - 2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
  - 3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  - 4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

- B. Conduit and equipment to be painted: Clean all conduit exposed to view in completed structure by removing plaster and dirt. Remove grease, oil and similar material from conduit and equipment by wiping with clean rags and suitable solvents in preparation for paint.

### 3.17 MOUNTING HEIGHTS

- A. In addition to careful review of the electrical drawings, this Contractor shall refer to all applicable details, plans, etc. and perform a site survey to determine exact positioning of electrical, telephone, data, television, video, etc. outlets prior to installations. Unless otherwise specifically instructed, centerline-mounting heights of outlets and other equipment shall be located as follows:
  - 1. Local Lighting Control Switches: Locate all outlets for single or gang switches 48" (top of box) above finish floor on strike side of door. If this location is such that it places the switch group partly in tiles or other finishes, the outlet shall be lowered sufficiently to bring the plate entirely on a flat surface (verify with Department before lowering outlet).
  - 2. Convenience Outlets: 18" above finished floor except as otherwise noted.
  - 3. Telecommunications Outlets: 18" above finished floor except as otherwise noted. Outlets for wall phones shall be located 60" above finished floor or as directed.
  - 4. CATV Outlets: 18" above finished floor except as otherwise noted. Coordinate locations for wall-mounted televisions with Architectural details and features.
  - 5. Outlets Above Countertops: 8" above top of counter without backsplash or 6" above top edge of backsplash except as otherwise noted.
  - 6. Blank Outlets: Coordinate location with served equipment manufacturers shop drawing and installation details for service connection point of access except as otherwise noted.
  - 7. Where similar types of outlets/devices are indicated on the drawings as being installed adjacent to each other on the same wall or in the same general area, but are indicated above as having different mounting heights, all similar outlets/devices shall be installed at the same mounting height. In such situations, confirm the mounting height with the Department.
  - 8. Fire Alarm Pull Stations: 48" above finished floor to top of box.
  - 9. Fire Alarm Audio/Visual and Visual Only Devices: The lower of 80" above finished floor (bottom of box) or 6" below ceiling (top of box).
  - 10. All fire alarm pull stations and audio/visual devices shall be installed on same vertical centerline.
  - 11. Safety Switches: 4' above finished floor, except as otherwise noted.
  - 12. Suspended Fixtures: As shown on drawings, as scheduled or as directed by the Department.

END OF SECTION 260500

SECTION 260510

ELECTRICAL EQUIPMENT WIRING

PART 1 - GENERAL

1.2 SECTION INCLUDES

- A. Mechanical Equipment wiring, and General Equipment wiring.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Products are specified within Divisions 26, 27, and 28 Sections.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The General, HVAC and Plumbing Contractors shall furnish all motors, starters, pushbuttons for local and remote control, controllers, pressure switches, aquastats or similar items together with all appurtenances, accessories and control wiring required to operate the equipment furnished under their respective sections of the contract, which is necessary to perform the operating functions as specified, shown on the drawings or as otherwise required.
- B. The General, HVAC and Plumbing Contractors shall set and mount all motors, starters and controls. This Contractor shall furnish and install all safety switches at the equipment and make all power connections to the safety switches, starters and the motors. All control wiring necessary for the required performance and operation of the equipment shall be installed and connected under each respective and associated contract. Where the starter and/or safety switch is an integral part of the equipment assembly, the assembly shall be furnished with the wiring being complete between the starter, controller and motor and this Contractor shall make the power connections only at the unit.

- C. If procurement requirements necessitate a change in the electrical characteristics of any motor or equipment being furnished under the General, HVAC or Plumbing Contract, the respective Contractor shall first obtain approval of such changes from the Department. The same Contractor shall also be responsible for all necessary arrangement and shall pay all costs, if any, for all required changes to this contract.

### 3.2 GENERAL REQUIREMENTS

- A. This Contractor shall furnish, install and connect all power wiring to all equipment and all associated controls and appurtenances provided under this section of the contract. In addition, this Contractor shall furnish, install and connect all power wiring to all equipment, associated controls and appurtenances provided under other sections of this contract, unless otherwise specified herein or indicated on the drawings. All necessary and required control wiring for the aforementioned equipment and systems shall be furnished, installed and connected by the respective Contractors providing the equipment, unless otherwise specified herein or indicated on the drawings.

### 3.3 WIRING FOR HEATING, VENTILATING AND AIR CONDITIONING

- A. All equipment for the heating, ventilating and air conditioning systems shall be furnished and installed under the HVAC Contract, unless otherwise indicated.
- B. This Contractor shall be responsible for furnishing all labor and materials required for the installation and connection of all electrical power wiring to and for the HVAC equipment, unless otherwise indicated.
- C. In general, all starters and special control equipment required for the heating, ventilating and air conditioning equipment such as the unit heaters, air handling units, etc., will be furnished and installed under the temperature control section of the HVAC Contract, unless otherwise indicated.

### 3.4 TEMPERATURE CONTROL WIRING

- A. All interconnecting control wiring associated with the temperature control system(s) for heating and air conditioning system(s) shall be furnished, installed and connected under the HVAC Contract.
- B. This Contractor shall provide a source of power and make final power connections for all temperature control system equipment (air handling units, etc.) and at each apparatus control panel location. Temperature Control Panels shall be furnished and installed under the HVAC Contract.

### 3.5 ELECTRICAL WORK FOR ROOF VENTILATORS AND/OR EXHAUST FANS

- A. For single-phase units, a motor starting disconnecting type snap switch shall be furnished as an integral part of the roof ventilator or exhaust fan. However, this Contractor shall furnish a

remote control thermal overload switch with pilot light. Switch shall be installed within the room to be ventilated or exhausted, as indicated on the drawings but generally adjacent to unit.

- B. For 3-phase units, this Contractor shall furnish and install remote control switches, together with pilot lights, within the room to be ventilated or exhausted at location as indicated on the drawings. In addition, the Contractor shall furnish and install a disconnect switch (in proper NEMA rated enclosure) at motor location.

### 3.6 WIRING FOR PLUMBING EQUIPMENT

- A. All equipment for the plumbing system shall be furnished and installed under the Plumbing Contract, unless otherwise indicated.
- B. This Contractor shall be responsible for furnishing all labor and materials required for the installation and connection of all electrical power wiring to and for the Plumbing equipment, unless otherwise indicated.
- C. In general, all starters and special control equipment required for electrically operated equipment furnished under the Plumbing Contract, such as the pumps and electric water heaters will be furnished and installed by the Plumbing Contractor.

### 3.7 ELECTRICAL EQUIPMENT BY OTHERS

- A. All electrical equipment furnished and installed under contracts other than this contract shall be furnished with full complement of control equipment, control wiring, conduit and all other items necessary for satisfactory operation.
- B. Remote motor starters for equipment furnished under contracts other than this contract shall be furnished and installed by the respective Contractor providing the equipment.
- C. This Contractor shall furnish and install fused disconnect switches, to include properly rated and type of fuses, for all 3-phase equipment unless otherwise indicated.
- D. This Contractor shall furnish and install thermal overload switches for each single phase motor except where units are furnished with built-in thermal protection, in which case this Contractor shall furnish and install a single pole switch, with or without pilot light as indicated on the drawings or directed by the Department.
- E. This Contractor shall complete all power wiring through the disconnect switch and/or thermal cutouts and local control stations to the equipment as required.
- F. This Contractor shall complete all electrical connections, through the disconnect switch, starter and motor terminals of all 3-phase equipment. This Contractor shall be responsible for final connections.
- G. This Contractor shall be responsible for proper direction of rotation of 3-phase motors.
- H. This Contractor shall provide disconnect switches for all 3-phase equipment. Combination motor starter/disconnect switches shall be furnished and installed under the contracts providing

the equipment. This Contractor shall provide disconnect switches at motor when motors are located away from combination starter/disconnect switches.

### 3.8 LOCATIONS

- A. This Contractor shall apply for detailed and specific information regarding the location of all equipment as the final location may differ from that indicated on the drawings. Outlets, equipment or wiring improperly placed because of this Contractor's failure to obtain this information shall be relocated and reinstalled without additional expense to the Department.
- B. The design shall be subject to such revisions as may be necessary to overcome building obstructions. No changes shall be made in location of outlets or equipment without written consent of the Department.
- C. This Contractor is cautioned that all outlet information must be checked and verified before installation; and all stub-ups into equipment must be as indicated and detailed on the respective shop drawings.
- D. Unless otherwise detailed on the drawings, rough-in of proper size and capacity of mechanical equipment indicated on the drawings as "Future" or "N.I.C." shall be provided and installed in such a manner and location that future final connections can be made with a minimum of work and without cutting or patching permanent walls, partitions, ceiling or floors.
- E. Engineering drawings are, of necessity, schematics for special equipment as exact roughing-in and requirements may vary with different manufacturers. Each trade shall connect its respective services to all special equipment indicated on the drawings at no additional cost to the Department.

END OF SECTION 260510

## SECTION 260519

### LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

#### PART 1 - GENERAL

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Building wires rated 600 V and less.
  - 2. Connectors, splices, and terminations rated 600 V and less.

##### 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.

##### 1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

##### 1.6 COORDINATION

- A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

#### PART 2 - PRODUCTS



## 2.1 CONDUCTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Alcan Products Corporation; Alcan Cable Division.
  - 2. American Insulated Wire Corp.; a Leviton Company.
  - 3. General Cable Corporation.
  - 4. Senator Wire & Cable Company.
  - 5. Southwire Company.
- B. Copper Conductors: Comply with NEMA WC 70.
- C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.

## 2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. AFC Cable Systems, Inc.
  - 2. Hubbell Power Systems, Inc.
  - 3. O-Z/Gedney; EGS Electrical Group LLC.
  - 4. 3M; Electrical Products Division.
  - 5. Tyco Electronics Corp.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

## PART 3 - EXECUTION

### 3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

### 3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, single conductors in raceway.

- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
- H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- I. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- J. Class 2 Control Circuits: Type THHN-THWN, in raceway.

### 3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls and ceilings unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

### 3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

**END OF SECTION 260519**

## SECTION 260526

### GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

##### 1.2 SUMMARY

- A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of product, include data on features, accessories and finishes.
- B. Shop drawings: For each type of product, indicate dimensions, weights, methods of field assembly, components, features, and accessories.
- C. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in Part 3 "Field Quality Control" Article, including the following:
  - 1. Test wells.
  - 2. Ground rods.
- D. 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.
- C. Comply with NFPA 70; for overhead line construction and medium voltage underground construction, comply with IEEE C2.
- D. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Grounding Conductors, Cables, Connectors, and Conductors.
    - 1. Copperweld Corp.
    - 2. Framatome Connectors/Burndy Electrical
    - 3. O-Z/Gedney
    - 4. RACO
    - 5. Thomas & Betts
    - 6. Or approved equal.

### 2.2 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables" specification section 260519. Wire shall be UL listed, copper, Class B stranded, 600 volt at 90 degrees C THHN/THWN insulated according to the NEC.
- B. Material: copper.
- C. Equipment Grounding Conductors: Insulated with green-colored insulation.
- D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three (3) bands of green and two (2) bands of yellow.
- E. Grounding Electrode Conductors: Stranded, except that sizes No. 10 AWG and smaller shall be solid.
- F. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- G. Bare Copper Conductors: Comply with the following:
  - 1. Solid Conductors: ASTM B 3.
  - 2. Assembly of Stranded Conductors: ASTM B 8.
  - 3. Tinned Conductors: ASTM B 33.
- H. Copper Bonding Conductors: As follows:
  - 1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch in diameter.
  - 2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.

3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
  4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- I. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

## 2.3 CONNECTOR PRODUCTS

- A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.
- B. Comply with NEC Article 250.
- C. Bolted Connectors: Bolted-pressure-type connectors. Connectors shall be of high strength bronze with silicon bronze clamping bolts and hardware, bolts, nuts, lock-washers and similar hardware designed not to damage ground wire.
- D. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions. Connector types as follows:
  1. Cable to tee splice and X connectors.
  2. Structural steel to ground connectors.
  3. Ground rod connectors.
  4. Bus bar connections.

## 2.4 CONDUIT GROUND BUSHINGS

- A. Galvanized malleable iron with screw pressure connector; insulated throat where required.

## 2.5 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel, sectional type; 5/8 inch by 8 feet.

# PART 3 - EXECUTION

## 3.1 APPLICATIONS

- A. Underground Grounding Conductors: Install bare copper conductor, No. 4/0 AWG minimum.
  1. Bury at least 30 inches below grade.
  2. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.
- B. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus on insulated spacers 1 inch (25 mm), minimum, from wall 6 inches (150 mm) above finished floor, unless otherwise indicated.
  2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, down to specified height above floor, and connect to horizontal bus.
- C. Conductor Terminations and Connections:
1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
  2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
  3. Connections to Ground Rods at Test Wells: Bolted connectors.
  4. Connections to Structural Steel: Welded connectors.

### 3.2 EQUIPMENT GROUNDING CONDUCTORS

- A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
- B. Install equipment grounding conductors in all feeders and branch circuits.
- C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC:
1. Feeders and branch circuits.
  2. Lighting circuits.
  3. Receptacle circuits.
  4. Single-phase motor and appliance branch circuits.
  5. Three-phase motor and appliance branch circuits.
  6. Flexible raceway runs.
  7. Armored and metal-clad cable runs.
- D. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
- E. Telecommunication & Signal Systems:
1. At the Telecom Service Entrance, General Telecom Equipment Locations, and Telecom Closets, provide solid copper grounding busbars 1/4" thick by 4" high by 12" long installed with insulated standoffs. Each busbar shall be drilled with rows of holes according to NEMA standards, for attachment of bolted compression fittings.
  2. Telecom equipment, frames, cabinets, and voltage protectors shall be grounded to the busbars. The busbars shall be connected by a backbone of cable between all closets and rooms. The backbone shall be connected to a main grounding busbar in the telecom entrance facility, to the electrical distribution grounding electrode system, and to structural steel on each floor.

3. Provide insulated, copper No. 1/0 AWG minimum telecom bonding (grounding) conductors in raceway for the backbone cable between all telecom equipment and busbars.
  4. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- F. Air Duct Equipment Circuits: Install an equipment grounding conductor to duct mounted electrical devices operating at 120 volts and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.
  - G. Water Heater, Heat Tracing, and Anti-Frost Heating Cables: Install a separate equipment grounding conductor to each electric water heater, heat tracing, and anti-frost cable. Bond conductor to each unit and to air duct.
  - H. Nonmetallic Raceways: Install an equipment grounding conductor in each nonmetallic raceway unless designated for telephone or data cables only.

### 3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive ground rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.
  1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
  2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Test Wells: Ground rod driven through drilled hole in bottom of handhole and shall be at least 12 inches (300 mm) deep, with cover.
  1. Test Wells: Install at least one test well for each service, unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- D. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
- E. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding



conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

- F. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.
- G. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.

### 3.4 CONNECTIONS

- A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
  - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
  - 2. Make connections with clean, bare metal at points of contact.
- B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable. All connections to ground rods and structural steel shall be exothermic-welded.
- C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Non-Contact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
- E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
- F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
- G. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

### 3.5 FIELD QUALITY CONTROL

#### A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
3. Equipment Rated 500 kVA and Less: 10 ohms.
4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Department promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

## SECTION 260529

### HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Hangers and supports for electrical equipment and systems.
  - 2. Construction requirements for concrete bases.

##### 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 each type of product indicated. Submit as required in section 013000.

## 1.6 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- 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, National Electrical Code.

## 1.7 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are detailed in "Cast-In-Place Concrete" specification section 033000.

## PART 2 - PRODUCTS

### 2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Allied Tube & Conduit.
    - b. Cooper B-Line, Inc.; a division of Cooper Industries.
    - c. ERICO International Corporation.
    - d. GS Metals Corp.
    - e. Thomas & Betts Corporation.
    - f. Unistrut; Tyco International, Ltd.
    - g. Wesanco, Inc.
    - h. Or approved equal.
  - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
  - 3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
  - 4. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

- C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
  - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      - 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) Or approved equal.
  - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel 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, but are not limited to, the following:
      - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
      - 2) Empire Tool and Manufacturing Co., Inc.
      - 3) Hilti Inc.
      - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      - 5) MKT Fastening, LLC.
      - 6) Or approved equal.
  - 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 steel. 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 "Metal Fabrications" specifications section 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 more restrictive.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70, National Electrical Code. Minimum rod size shall be 1/4 inch in diameter.
- C. Support individual horizontal raceways with separate, steel or malleable-iron pipe hangers or clamps.
- D. 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, or single-bolt conduit clamps using spring friction action for retention in support channel.
- E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2 inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

### 3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified herein.
- B. Install support devices to securely and permanently fasten and support electrical components from building structure. Support electrical equipment from building structure independently of other equipment, piping, ducts, suspended ceiling T-bars, etc.
- C. 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.
- D. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

- E. 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 thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
  6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts; beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69; or Spring-tension clamps.
  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.
- F. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.
- G. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.
- H. Arrange supports in vertical runs so that the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals. Simultaneously install vertical conductor supports with conductors.

### 3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in "Metal Fabrications" specification section 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 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 concrete as specified in Section 260500 “Common Work Results for Electrical.” Concrete materials, reinforcement, and placement requirements are specified in “Cast-In-Place Concrete” specification section 033000.
- 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.
- B. Touchup: Comply with requirements in “Painting” specification section 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

##### 1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

##### 1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. FMC: Flexible metal conduit.
- D. IMC: Intermediate metal conduit.
- E. LFMC: Liquidtight flexible metal conduit.
- F. LFNC: Liquidtight flexible nonmetallic conduit.
- G. RNC: Rigid nonmetallic conduit.
- H. RSPVC: PVC coated rigid steel conduit.

##### 1.4 SUBMITTALS

- A. Product Data: For raceways, boxes, enclosures, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets. Submit as required in section 013000.

##### 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, National Electrical Code.

## 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, but are not limited to, the following:
  - 1. AFC Cable Systems, Inc.
  - 2. Alflex Inc.
  - 3. Allied Tube & Conduit
  - 4. Anamet Electrical, Inc.; Anaconda Metal Hose.
  - 5. Manhattan/CDT/Cole-Flex
  - 6. O-Z Gedney
  - 7. Wheatland Tube Company
  - 8. Or approved equal.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. IMC: ANSI C80.6.
- D. PVC-Coated Steel Conduit (RSPVC): PVC-coated rigid steel conduit.
  - 1. Comply with NEMA RN 1.
  - 2. Coating Thickness: 0.040 inch, minimum.
- E. EMT: ANSI C80.3.
- F. FMC: Zinc-coated steel
- G. LFMC: Flexible steel conduit with PVC jacket.
- H. Fittings for Conduit (Including all Types and Flexible and Liquidtight), and EMT: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
  - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
  - 2. Fittings for EMT: Steel or die-cast, compression type.
  - 3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch, with overlapping sleeves protecting threaded joints.
- I. 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

- 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. AFC Cable Systems, Inc.
  - 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
  - 3. CertainTeed Corp.; Pipe & Plastics Group.
  - 4. Electri-Flex Co.
  - 5. Carlon Electrical Products.
  - 6. RACO
  - 7. Thomas & Betts Corporation
  - 8. Or approved equal.
- B. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.
- C. Fittings for RNC: NEMA TC 3; match to conduit type and material.

## 2.3 METAL WIREWAYS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Cooper B-Line, Inc.
  - 2. Hoffman.
  - 3. Square D; Schneider Electric.
  - 4. Austin Electrical Enclosures.
  - 5. Or approved equal.
- B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Hinged type.
- E. Finish: Manufacturer's standard enamel finish.

## 2.4 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
  - 2. EGS/Appleton Electric.
  - 3. Hoffman.
  - 4. Hubbell Incorporated
  - 5. O-Z/Gedney

6. RACO
  7. Thomas & Betts Corporation.
  8. Walker Systems, Inc.; Wiremold Company
  9. Or approved equal.
- 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 , fully adjustable, rectangular.
  - F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
  - G. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
  - H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated. Steel, finished inside and out with manufacturer's standard enamel.
  - I. 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.

## 2.5 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 thickness as indicated and of length to suit application.

## PART 3 - EXECUTION

### 3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
  1. Exposed Conduit: IMC.
  2. Concealed Conduit, Aboveground: IMC.

3. Underground Conduit: RNC, Type EPC-40-PVC.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

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: IMC. 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. Garage areas up to 12'-0" above finished floor.
3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
5. Damp or Wet Locations: IMC.
6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4 inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
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. Aluminum raceways are permitted for such circuits, but where they pass through concrete they shall be installed in a nonmetallic sleeve. Do not install aluminum conduits in contact with concrete.

F. Aluminum conduits are not acceptable for any application, unless otherwise noted.

### 3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.

- D. Support raceways as specified in "Hangers and Supports for Electrical Systems" specification section 260529.
- 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 1 inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
  - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
  - 3. Change from RNC to IMC 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, including conductors smaller than No. 4 AWG.
- K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200 lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- L. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
  - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  - 2. Where otherwise required by NFPA 70.
- M. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semi-recessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors. Use LFMC in damp or wet locations.
- N. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.
- O. Set metal floor boxes level and flush with finished floor surface.
- P. Do not install aluminum boxes, enclosures, or cabinets in contact with concrete.

### 3.3 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. 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.
- B. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- C. Rectangular Sleeve Minimum Metal Thickness:
  - 1. For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
  - 2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches above finished floor level.
- G. Size pipe sleeves to provide 1/4 inch annular clear space between sleeve and raceway unless sleeve seal is to be installed.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint.
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Consider all floor, mechanical rooms, electrical rooms, corridors (or halls), stairtowers, and 2<sup>nd</sup> floor ceiling as 1 hour rated.
- K. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1 inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- M. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1 inch annular clear space between raceway and sleeve for installing mechanical sleeve seals.

### 3.4 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground, exterior wall penetrations.

- B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

### 3.5 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

### 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

1.2 SUMMARY

A. This Section includes the following:

1. Identification for raceway and metal-clad cable.
2. Identification for conductors and communication and control cable.
3. Underground-line warning tape.
4. Warning labels and signs.
5. Instruction signs.
6. Equipment identification labels.
7. Miscellaneous identification products.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated. Submit as required in section 01300.

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 ANSI A13.1 and ANSI C2.
- C. Comply with NFPA 70, National Electrical Code.
- D. Comply with 29 CFR 1910.145.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, 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 RACEWAY 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. Color for Printed Legend:
  - 1. Power Circuits: Black letters on an orange field.
  - 2. Legend: Indicate system or service and voltage, if applicable.
- C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

### 2.2 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

### 2.3 UNDERGROUND-LINE WARNING TAPE

- A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.
  - 1. Not less than 6 inches wide by 4 mils thick.
  - 2. Compounded for permanent direct-burial service.
  - 3. Embedded continuous metallic strip or core.
  - 4. Printed legend shall indicate type of underground line.

### 2.4 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.

- B. Self-Adhesive Warning Labels for interior use: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
- C. Baked-Enamel Warning Signs for interior use: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 7 by 10 inches.
- D. Metal-Backed, Butyrate Warning Signs for exterior use: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396 inch galvanized-steel backing; and with colors, legend, and size required for application. 1/4 inch grommets in corners for mounting. Nominal size, 10 by 14 inches.
- E. Warning label and sign shall include, but are not limited to, the following legends:
  - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
  - 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

## 2.5 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.
  - 1. Engraved legend with black letters on white face.
  - 2. Punched or drilled for mechanical fasteners.
  - 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

## 2.6 EQUIPMENT IDENTIFICATION LABELS

- A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

## 2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
  - 1. Minimum Width: 3/16 inch.
  - 2. Tensile Strength: 50 lb, minimum.
  - 3. Temperature Range: Minus 40 to plus 185 deg F.
  - 4. Color: Black, except where used for color-coding.
- B. Paint: Paint materials and application requirements are specified in "Exterior Painting" specification section 099113 and "Interior Painting" specification section 099123.
  - 1. Exterior Concrete, Stucco, and Masonry (Other Than Concrete Unit Masonry):

- a. Semi-gloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
  - 1) Primer: Exterior concrete and masonry primer.
  - 2) Finish Coats: Exterior semi-gloss acrylic enamel.
2. Exterior Concrete Unit Masonry:
  - a. Semi-gloss Acrylic-Enamel Finish: Two finish coat(s) over block filler.
    - 1) Block Filler: Concrete unit masonry block filler.
    - 2) Finish Coats: Exterior semi-gloss acrylic enamel.
3. Exterior Ferrous Metal:
  - a. Semi-gloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.
    - 1) Primer: Exterior ferrous-metal primer.
    - 2) Finish Coats: Exterior semi-gloss alkyd enamel.
4. Exterior Zinc-Coated Metal (except Raceways):
  - a. Semi-gloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.
    - 1) Primer: Exterior zinc-coated metal primer.
    - 2) Finish Coats: Exterior semi-gloss alkyd enamel.
5. Interior Concrete and Masonry (Other Than Concrete Unit Masonry):
  - a. Semi-gloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.
    - 1) Primer: Interior concrete and masonry primer.
    - 2) Finish Coats: Interior semi-gloss alkyd enamel.
6. Interior Concrete Unit Masonry:
  - a. Semi-gloss Acrylic-Enamel Finish: Two finish coat(s) over block filler.
    - 1) Block Filler: Concrete unit masonry block filler.
    - 2) Finish Coats: Interior semi-gloss acrylic enamel.
7. Interior Gypsum Board:
  - a. Semi-gloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
    - 1) Primer: Interior gypsum board primer.
    - 2) Finish Coats: Interior semi-gloss acrylic enamel.
8. Interior Ferrous Metal:
  - a. Semi-gloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
    - 1) Primer: Interior ferrous-metal primer.

- 2) Finish Coats: Interior semi-gloss acrylic enamel.
9. Interior Zinc-Coated Metal (except Raceways):
    - a. Semi-gloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
      - 1) Primer: Interior zinc-coated metal primer.
      - 2) Finish Coats: Interior semi-gloss acrylic enamel.
  - C. 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 APPLICATION

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A: Identify with orange self-adhesive vinyl label, snap-around label, or self-adhesive vinyl tape applied in bands.
- B. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, self-adhesive vinyl tape applied in bands, or snap-around, color-coding bands:
  1. Fire Alarm System: Red.
  2. Fire-Suppression Supervisory and Control System: Red and yellow.
  3. Combined Fire Alarm and Security System: Red and blue.
  4. Security System: Blue and yellow.
  5. Mechanical and Electrical Supervisory System: Green and blue.
  6. Telecommunication System: Green and yellow.
  7. Control Wiring: Green and red.
- C. Power-Circuit Conductor Identification: For primary and secondary conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape, marker tape, aluminum wraparound marker labels, or metal tags. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.
- D. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape, marker tape, aluminum wraparound marker labels, or metal tags. Identify each ungrounded conductor according to source and circuit number.
- E. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data 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 Operation and Maintenance Manual.
- F. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for direct-buried cables, cables in raceway, and cables in concrete encased duct banks.
- G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels, baked-enamel warning signs, or metal-backed, butyrate warning signs. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
    - a. Power transfer switches.
    - b. Controls with external control power connections.
  2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.
- H. Instruction Signs:
1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
  2. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum 3/8 inch high letters for emergency instructions at equipment used for power transfer or load shedding.
- I. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with drawings, wiring diagrams, schedules, and 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: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2 inch high letters on 1-1/2 inch high label; where 2 lines of text are required, use labels 2 inches high.
    - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label; legend 4 inches high.
    - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
  2. Equipment to Be Labeled:

- a. Panelboards, electrical cabinets, and enclosures.
- b. Access doors and panels for concealed electrical items.
- c. Electrical switchgear and switchboards.
- d. Transformers.
- e. Emergency system boxes and enclosures.
- f. Disconnect switches.
- g. Enclosed circuit breakers.
- h. Motor starters.
- i. Push-button stations.
- j. Power transfer equipment.
- k. Contactors.
- l. Voice and data cable terminal equipment.
- m. Fire-alarm control panel and annunciators.
- n. Security and intrusion-detection control stations, control panels, terminal cabinets, and racks.
- o. Monitoring and control equipment.
- p. Terminals, racks, and patch panels for voice and data communication and for signal and control functions.

### 3.2 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach non-adhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.
- F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50 foot maximum intervals in straight runs, and at 25 foot maximum intervals in congested areas.
- G. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.
  - 1. Color shall be factory applied or, for sizes larger than No. 10 AWG if authorities having jurisdiction permit, field applied.
  - 2. Colors for 240/120-V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.
    - c. Phase C: Blue.

3. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
- J. Painted Identification: Prepare surface and apply paint according to “Interior Painting” specification section 099123.

END OF SECTION 260553



SECTION 262416

PANELBOARDS

PART 1 - GENERAL

1.2 SUBMITTALS

- A. Product Data: For each type of panelboard, overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes. Submit panelboards with Short Circuit Overcurrent Protective Device Coordination Study such that panelboards have already been coordinated with the requirements of the study.
- B. Shop Drawings: For each panelboard and related equipment.
  - 1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
    - a. Enclosure types and details for types other than NEMA 250, Type 1.
    - b. Bus configuration, current, and voltage ratings.
    - c. Short-circuit current rating of panelboards and overcurrent protective devices.
    - d. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - 2. Wiring Diagrams: Power, signal, and control wiring.
- C. Field quality-control test reports including the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- D. Panelboard Schedules: Typewritten (not handwritten), for installation in panelboards. Submit final versions after load balancing.
- E. Operation and Maintenance Data: For panelboards and components to include in operation, and maintenance manuals. In addition to items specified in Division 1 Section " Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

### 1.3 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. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7.
- C. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories through one source from a single manufacturer.
- D. Product Options: Drawings indicate size, profiles, and dimensional requirements of panelboards and are based on the specific system indicated.
- E. 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.
- F. Comply with NEMA PB 1.
- G. Comply with NFPA 70.

### 1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:
  1. Ambient Temperature: Not exceeding 104 deg F.
  2. Altitude: Not exceeding 6600 feet.
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
  1. Ambient temperatures within limits specified.
  2. Altitude not exceeding 6600 feet.

- C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Using Agency or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
  - 1. Notify Department no fewer than ten (10) days in advance of proposed interruption of electrical service.
  - 2. Do not proceed with interruption of electrical service without written permission from the Department.

#### 1.5 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.
- B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

#### 1.6 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Keys: Three spares for each type of panelboard cabinet lock.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- 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. Panelboards, Overcurrent Protective Devices:
    - a. Eaton Corporation; Cutler-Hammer
    - b. Square D
    - c. Siemens Energy & Automation, Inc.
    - d. General Electric
    - e. Or approved equal

#### 2.2 MANUFACTURED UNITS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces.
- B. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1.
  - 1. Rated for environmental conditions at installed location.

- a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
  2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
  3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
  4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
  5. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
  6. Finishes:
    - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    - b. Back Boxes: Galvanized steel.
  7. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door with neat typewritten circuit directory.
- C. Phase, Neutral and Ground Buses:
1. Material: Aluminum.
  2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
  3. Isolated Equipment Ground Bus: Adequate for branch-circuit equipment ground conductors; insulated from box (provide where indicated on drawing).
  4. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads (provide where indicated on drawing).
  5. Split Bus: Vertical buses divided into individual vertical sections (provide where indicated on drawings).
- D. Conductor Connectors: Suitable for use with conductor material.
1. Main and Neutral Lugs: Mechanical type.
  2. Ground Lugs and Bus Configured Terminators: Mechanical type.
  3. Feed-Through Lugs: Mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
  4. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus, where indicated on drawing.
- E. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.
- F. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

### 2.3 PANELBOARD SHORT-CIRCUIT RATING

- A. Series-connected short-circuit rating is **NOT** acceptable.
- B. Fully rated to interrupt symmetrical short-circuit current available.

### 2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.
- B. Main Overcurrent Protective Devices: Circuit breaker, unless noted otherwise on panelboard schedule.
- C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

### 2.5 DISTRIBUTION PANELBOARDS

- A. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
- B. Main Overcurrent Protective Devices: Circuit breaker, unless noted otherwise on panelboard schedule, electronic trip, fully adjustable. All settings shall be coordinated with the short circuit/coordination study prior to shop drawing submittal. Submit panelboard and short circuit/coordination study at the same time.
- C. Branch Overcurrent Protective Devices:
  - 1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
  - 2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

### 2.6 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: UL 489, with full interrupting capacity rating to meet available fault currents (series-connected rating **NOT** acceptable).
  - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
  - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
  - 3. Electronic trip-unit circuit breakers shall have RMS sensing; field-replaceable rating plug; and with the following field-adjustable settings:
    - a. Instantaneous trip.
    - b. Long- and short-time pickup levels.
    - c. Long- and short-time time adjustments.
    - d. Ground-fault pickup level, time delay, and  $I^2t$  response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
  5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
  6. GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity for personnel protection GFI, and 30-mA trip sensitivity for equipment protection GFI.
- B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
  2. Ground-Fault Protection (where indicated on drawings): Integrally mounted or Remote-mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
  3. Shunt Trip (where indicated on drawings): 120-V trip coil energized from separate circuit.
  4. Undervoltage Trip (where indicated on drawings): Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
  5. Auxiliary Contacts (where indicated on drawings): Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
  6. Key Interlock Kit (where indicated on drawings): Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
  7. Zone-Selective Interlocking (where indicated on drawings): Integral with electronic trip unit; for interlocking ground-fault protection function.
  8. Multipole units enclosed in a single housing or factory-assembled to operate as a single unit.
- C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
- D. Fuses are specified in Section 262813 "Fuses."

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Comply with mounting and anchoring requirements specified in Section 260529 "Hangers and Supports for Electrical Systems."
- C. Mount top of trim 74 inches above finished floor, unless otherwise indicated.
- D. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- E. Install overcurrent protective devices and controllers.

1. Set field-adjustable switches and circuit-breaker trip ranges.
- F. Install filler plates in unused spaces.
  - G. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits down thru floor below if not slab on grade.
  - H. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

### 3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

### 3.3 CONNECTIONS

- A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

### 3.4 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
  1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
  2. Test continuity of each circuit.
- B. Perform the following field tests and inspections and prepare test reports:
  1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
  2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

### 3.5 CLEANING

- A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 262416



SECTION 262713

ELECTRICITY METERING

PART 1 - GENERAL

1.2 RELATED DOCUMENTS

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

1.3 SUMMARY

- A. Section includes equipment for electricity metering by utility company and electricity metering requested by Owner.

1.4 DEFINITIONS

- A. KY Pulse: Term used by the metering industry to describe a method of measuring consumption of electricity that is based on a relay opening and closing in response to the rotation of the disk in the meter.
- B. PC: Personal computer.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For electricity-metering equipment.
  - 1. Dimensioned plans and sections or elevation layouts.
  - 2. Wiring Diagrams: For power, signal, and control wiring. Identify terminals and wiring designations and color-codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit protection features.
- C. Operation and Maintenance Data. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Application and operating software documentation.
2. Software licenses.
3. Software service agreement.
4. Hard copies of manufacturer's operating specifications, design user's guides for software and hardware, and PDF files on CD-ROM of the hard-copy Submittal.

#### 1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Receive, store, and handle modular meter center according to NECA 400.

#### 1.8 COORDINATION

- A. Electrical Service Connections: Coordinate with utility companies and components they furnish as follows:
  1. Comply with requirements of utilities providing electrical power services.
  2. Coordinate installation and connection of utilities and services, including provision for electricity-metering components.

#### 1.9 SOFTWARE SERVICE AGREEMENT

- A. Technical Support: Beginning with Substantial Completion, provide software support for two years.
- B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
  1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade his computer equipment if necessary.
  2. All licenses shall be at no additional cost to the owner and shall be open ended and unrestricted use.
  3. Any and all passwords shall be given to the owner prior to final payment.

### PART 2 - PRODUCTS

#### 2.1 EQUIPMENT FOR ELECTRICITY METERING REQUESTED BY OWNER

- A. Manufacturers: Provide one of the following:

1. General Electric (GE) Model EPM 6000.
2. Square D Power Logic Model PM5560 (preferred).
3. Approved equal

B. General Requirements for Owner's Meters:

1. Comply with UL 1244.
2. Meters used for data collection shall have an accuracy of 0.2 percent of reading, complying with requirements in ANSI C12.20.
3. Enclosure: NEMA 250, Type 1 minimum, with hasp for padlocking or sealing.
4. Identification: Comply with requirements in Division 26 Section "Identification for Electrical Systems."
5. Memory Backup: Self-contained to maintain memory throughout power outages of 72 hours, minimum.
6. Sensors: Current-sensing type, with current or voltage output, selected for optimum range and accuracy for meters indicated for this application.
  - a. Type: Split core.
7. Current-Transformer Cabinet: Listed or recommended by metering equipment manufacturer for use with sensors indicated.
8. Building Automation System (BAS) Interface: One digital KY pulse to a user-definable increment of energy measurement. Match signal to BAS input and arrange to convey the instantaneous, integrated, demand level measured by meter to provide data for processing and possible programmed demand control action by destination system.
9. The system must be capable of reporting data to the Automated Logic head end at FTIG, Bldg 0-13 (ATTN: Kevin Perhach 717-861-6967). Provide all software and hardware for proper data transmission. Coordinate points and data prior to shop drawing submittal.
10. The meter MUST be configurable in the field without the use of a laptop. It must have a menu driven system with appropriate buttons for selection and navigation built into the meter.

C. Kilowatt-hour/Demand Meter: Electronic three-phase meters, measuring electricity use and demand. Demand shall be integrated over a 15-minute interval.

1. Voltage and Phase Configuration: Meter shall be designed for use on circuits with voltage rating and phase configuration indicated for its application.
2. Display: LCD with characters not less than 0.25 inch (6 mm) high, indicating accumulative kilowatt-hours, current time and date, current demand, and historic peak demand, and time and date of historic peak demand. Retain accumulated kilowatt-hour and historic peak demand in a nonvolatile memory, until reset.

D. Software: PC based, loaded by means of cable into meter and is a product of meter manufacturer.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with equipment installation requirements in NECA 1.
- B. Install meters furnished by utility company. Install raceways and equipment according to utility company's written requirements. Provide empty conduits for metering leads and extend grounding connections as required by utility company.

### 3.2 IDENTIFICATION

- A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
  - 1. Equipment Identification Labels: See "Identification for Electrical Systems".

END OF SECTION 262713

SECTION 262726

WIRING DEVICES

PART 1 - GENERAL

1.2 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Isolated-ground receptacles.
4. Snap switches.
5. Wall-switch and ceiling occupancy sensors.
6. Communications outlets.
7. Cord and plug sets.
8. Multi-outlet assemblies.

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. Submit as required in section 013000.
- B. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

## 1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one 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, National Electrical Code.

## 1.6 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
  - 1. Cord and Plug Sets: Match equipment requirements.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Cooper Wiring Devices
  - 2. Hubbell Incorporated
  - 3. Leviton Mfg. Company Inc.
  - 4. Pass & Seymour
  - 5. Or approved equal.

### 2.2 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Cooper; 5351 (single), 5352 (duplex).
    - b. Hubbell; HBL5351 (single), CR5352 (duplex).
    - c. Leviton; 5891 (single), 5352 (duplex).
    - d. Pass & Seymour; 5381 (single), 5352 (duplex).
    - e. Or approved equal.
- B. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Hubbell; CR 5253IG.
  - b. Leviton; 5362-IG.
  - c. Pass & Seymour; IG6300.
  - d. Or approved equal.
2. Description: 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.

## 2.3 GFCI RECEPTACLES

- A. General Description: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
  1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Cooper; GF20.
    - b. Pass & Seymour; 2084.
    - c. Or approved equal.
- C. Isolated-Ground, Duplex Convenience Receptacles:
  1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Cooper; IG5362BLS.
    - b. Hubbell; IG5362SA.
    - c. Leviton; 5380-IG.
    - d. Or approved equal.
  2. Description: Straight blade, 125 V, 20 A; NEMA WD 6 configuration 5-20R. 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.

## 2.4 TWIST-LOCKING RECEPTACLES

- A. Single Convenience Receptacles, 125 V, 20 A (unless noted otherwise): Comply with NEMA WD 1, NEMA WD 6 configuration L5-20R (unless noted otherwise), and UL 498.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Cooper; L520R.
  - b. Hubbell; HBL2310.
  - c. Leviton; 2310.
  - d. Pass & Seymour; L520-R.
  - e. Or approved equal.

## 2.5 CORD AND PLUG SETS

- A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.
  1. 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.
  2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

## 2.6 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:
  1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
    - b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
    - c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
    - d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).
    - e. Or approved equal.

## 2.7 OCCUPANCY SENSORS

- A. Wall-Switch Sensors:
  1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. SensorSwitch; WSD-PDT-2P.
    - b. Hubbell.
    - c. Leviton.
    - d. Pass & Seymour.



- e. Watt Stopper (The).
  - f. Or approved equal.
2. Description: Dual technology, passive-infrared and microphonics (ultrasonic acceptable) type, 120/277 V, adjustable time delay up to 30 minutes, 180-degree field of view, with a minimum coverage area of 600 sq. ft. Two pole units, mounted in a single gang box, with individually programmed poles. Poles may be programmed for full auto, semi-auto or reduced turn-on. Units 3-way and 4-way switching compatible. Program sensors such that the single lamp ballasts turn on upon entry, and the two lamp ballasts turn on manually. Set time delay to five minutes.

B. Ceiling Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- a. SensorSwitch; CMR-PDT-2P.
  - b. Hubbell.
  - c. Leviton.
  - d. Pass & Seymour.
  - e. Watt Stopper (The).
  - f. Or approved equal.
2. Description: Dual technology, passive-infrared and microphonics (ultrasonic acceptable) type, 120/277 V, adjustable time delay up to 30 minutes, 360-degree field of view, with a minimum coverage area of 1200 sq. ft. Two pole units, mounted in a square (or round) box, with individually programmed poles. Sensor is equipped with time delay relays for each pole. Each pole may be programmed individually. Program sensors such that the lights and exhaust fan turn on when occupied, lights turn off after 5 minute delay and the exhaust fan turns off after a 10 minute delay.

## 2.8 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: 0.035 inch thick, satin-finished stainless steel.
- 3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
- 4. Material for Damp Locations: Thermoplastic 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 die-cast aluminum with lockable cover and rated weatherproof while in use.

## 2.9 MULTIOUTLET ASSEMBLIES

- 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. Hubbell Incorporated
  - 2. Wiremold Company
  - 3. Or approved equal.
- 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.
- D. Wire: No. 12 AWG.

## 2.10 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color. Colors shall be determined by the Engineer for all products listed.
  - 1. Wiring Devices Connected to Normal Power System: Gray (may be noted on submittal when returned), unless otherwise indicated or required by NFPA 70 or device listing.
  - 2. Wiring Devices Connected to Standby Emergency Power System: Gray.
  - 3. TVSS Devices: Blue.
  - 4. Isolated-Ground Receptacles: As specified above, with orange triangle on face.

## 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 and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
  - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
  - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
  - a. Cut back and pigtail, or replace all damaged conductors.
  - b. Straighten conductors that remain and remove corrosion and foreign matter.
  - c. Pigtailling existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 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.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

### 3.2 FIELD QUALITY CONTROL

A. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.

5. Using the test plug, verify that the device and its outlet box are securely mounted.
  6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- B. Test straight blade for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz.

END OF SECTION 262726

## SECTION 262813

### FUSES

#### PART 1 - GENERAL

##### 1.2 SUMMARY

###### A. Section Includes:

1. Cartridge fuses rated 600-V ac and less for use in control circuits, enclosed switches, panelboards, switchboards, enclosed controllers and motor-control centers.
2. Plug fuses rated 125-V ac and less for use in plug-fuse-type enclosed switches, fuseholders and panelboards.

##### 1.3 SUBMITTALS

###### A. Product Data: For each type of product indicated. Submit as required in section 013000. 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, when requested by the Engineer.
4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse, when requested by the Engineer.
5. Coordination charts and tables and related data, when requested by the Engineer.

- B. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Instruction to Bidders Specification Section 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, for use within a specific product or circuit, from single source from single manufacturer.
- 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 NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Comply with UL 248-11 for plug fuses.

#### 1.5 PROJECT CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

#### 1.6 COORDINATION

- A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

#### 1.7 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. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Cooper Bussmann, Inc.
  - 2. Edison Fuse, Inc.
  - 3. Ferraz Shawmut, Inc.
  - 4. Littelfuse, Inc.
  - 5. Or approved equal.

### 2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

### 2.3 PLUG FUSES

- A. Characteristics: UL 248-11, nonrenewable plug fuses; 125-V ac.

## 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 (when applicable):

1. Service Entrance: Class RK1, dual-element, time delay; class RK1, fast acting; class L, fast acting; class L, dual-element, time delay; class J, fast acting; class J, time delay; class T, fast acting (as required).
2. Feeders: Class RK1, dual-element, time delay; class RK1, fast acting; class RK5, dual-element, time delay; or class RK5, fast acting; class L, fast acting; class L, dual-element, time delay; class J, fast acting; class J, time delay (as required).
3. Motor Branch Circuits: Class RK1, dual-element, time delay; or class RK5, dual-element, time delay (as required).
4. Other Branch Circuits: Class RK1, dual-element, time delay; or class RK5, dual-element, time delay; class J, fast acting; class J, time delay (as required).
5. Control Circuits: Class CC, dual-element, time delay; or class CC, fast acting (as required).

B. Plug Fuses:

1. Motor Branch Circuits: Edison-base type, time delay; or type S, time delay (as required).
2. Other Branch Circuits: Edison-base type, fast acting; Edison-base type, time delay; type S, time delay (as required).

### 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 detailed in "Identification for Electrical Systems" specification section 260553 and indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 262813



## SECTION 262816

### ENCLOSED SWITCHES AND CIRCUIT BREAKERS

#### PART 1 - GENERAL

##### 1.2 SUMMARY

###### A. Section Includes:

1. Fusible switches.

##### 1.3 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.

##### 1.4 QUALITY ASSURANCE

- ###### A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- ###### B. 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.
- ###### C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- D. Comply with NFPA 70.

## 1.5 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).

## 1.6 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 :
  1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  3. Siemens Energy & Automation, Inc.
  4. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 240 and 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
  1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  2. Lugs: Mechanical type, suitable for number, size, and conductor material.

## 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. Install fuses in fusible devices.
- C. Comply with NECA 1.

### 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 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 262816

SECTION 265100  
INTERIOR LIGHTING

PART 1 - GENERAL

1.2 SUMMARY

- A. This Section includes the following:
1. Interior lighting fixtures, lamps, and ballasts.
  2. Emergency lighting units.
  3. Exit signs.
  4. Lighting fixture supports.

1.3 DEFINITIONS

- A. BF: Ballast factor.
- B. CRI: Color-rendering index.
- C. LER: Luminaire efficacy rating.
- D. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.4 SUBMITTALS

- A. Product Data: Submit as required in section 013000. For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
1. Physical description of lighting fixture including dimensions.
  2. Emergency lighting units including battery and charger.
  3. Ballast.
  4. Energy-efficiency data.
  5. Photometric data, in IESNA format, based on laboratory tests of each lighting fixture type, outfitted with lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.

- B. Samples for Verification: Interior lighting fixtures designated for sample submission in the Lighting Fixture Schedule. Each sample shall include the following:
  - 1. Lamps: Specified units installed.
  - 2. Accessories: Cords and plugs.
- C. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
- D. Warranties: Special warranties specified in this Section.

#### 1.5 LIGHTING FIXTURE SUBSTITUTION

- A. The light fixture manufacturers catalog numbers describing the various types of light fixtures shall be used as a guide only and does not exclude all required accessories or hardware that may be required for a complete installation.
- B. The selected lighting fixtures, which are specified by manufacturer and catalog number, indicate the style, quality and photometric requirements desired and shall be utilized as a guide only by this Contractor in the purchasing of lighting fixtures. However, final approval of all light fixtures, whether it be those specified or their substitution, must be obtained by the Department before installation.
- C. If this Contractor elects to furnish lighting fixtures other than those specified, he shall submit all necessary and required photometric data, distribution curves, isolux charts, glare factor data, etc., along with catalog cuts and data sheets for each light fixture in order to properly analyze, evaluate and compare the light fixtures in question. In addition, the Department reserves the right to request that the Contractor furnish and submit a sample of each proposed substituted lighting fixture to an independent testing laboratory to confirm reports of the data previously submitted. The testing laboratory shall be one selected by the Department and the Contractor shall be responsible for paying all costs incurred thereof for these tests.

#### 1.6 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, National Electrical Code.

#### 1.7 COORDINATION

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including but not limited to HVAC equipment, fire-suppression system, fire alarm system, occupancy sensors, partition assemblies, etc.

## 1.8 WARRANTY

- A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period for Emergency Lighting Unit Batteries: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.
  - 2. Warranty Period for Emergency Fluorescent Ballast and Self-Powered Exit Sign Batteries: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.
- B. Special Warranty for Ballasts: Manufacturer's standard form in which ballast manufacturer agrees to repair or replace ballasts that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period for Electronic Ballasts: 5 years from date of Substantial Completion.
  - 2. Warranty Period for Electromagnetic Ballasts: 3 years from date of Substantial Completion.
- C. Special Warranty for T5 and T8 Fluorescent Lamps: Manufacturer's standard form, made out to Owner and signed by lamp manufacturer agreeing to replace lamps that fail in materials or workmanship, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
  - 1. Warranty Period: One year from date of Substantial Completion.

## 1.9 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. Lamps: 1 for every 10 of each type and rating installed. Furnish at least one of each type.
  - 2. Plastic Diffusers and Lenses: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
  - 3. Battery and Charger Data: One for each emergency lighting unit.
  - 4. Ballasts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
  - 5. Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least one of each type.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design for each lighting fixture is based on the product named in the lighting fixture schedule located on the drawings. Subject to compliance with requirements, provide either the named product or an approved equal.

### 2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Incandescent Fixtures: Comply with UL 1598.
- C. Fluorescent Fixtures: Comply with UL 1598.
- D. HID Fixtures: Comply with UL 1598.
- E. Metal Parts: Free of burrs and sharp corners and edges.
- F. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools, unless tamperproof type fixture. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- H. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
  - 1. White Surfaces: 85 percent.
  - 2. Specular Surfaces: 83 percent.
  - 3. Diffusing Specular Surfaces: 75 percent.
  - 4. Laminated Silver Metallized Film: 90 percent.
- I. Plastic Diffusers (lenses), Covers, and Globes:
  - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
    - a. Lens Thickness: At least 0.125 inch minimum unless different thickness is indicated.
    - b. UV stabilized.
  - 2. Glass: Annealed crystal glass, unless otherwise indicated.
- J. Electromagnetic-Interference Filters: Factory installed to suppress conducted electromagnetic-interference as required by MIL-STD-461E. Fabricate lighting fixtures with one filter on each ballast indicated to require a filter.

- K. Air-Handling Fluorescent Fixtures: For use with plenum ceiling for air return and heat extraction and for attaching an air-diffuser-boot assembly.
1. Air Supply Units: Slots in one or both side trims join with air-diffuser-boot assemblies.
  2. Heat Removal Units: Air path leads through lamp cavity.
  3. Combination Heat Removal and Air Supply Unit: Heat is removed through lamp cavity at both ends of the fixture door with air supply same as for air supply units.
  4. Dampers: Operable from outside fixture for control of return-air volume.
  5. Static Fixture: Air supply slots are blanked off, and fixture appearance matches active units.
- L. Fluorescent fixtures shall be provided with code required disconnecting means, i.e. plug set.

### 2.3 BALLASTS FOR LINEAR FLUORESCENT LAMPS

- A. Electronic Ballasts: Comply with ANSI C82.11; instant-start type, unless otherwise indicated, and designed for type and quantity of lamps served. Ballasts shall be designed for full light output unless dimmer or bi-level control is indicated.
1. Sound Rating: A.
  2. Total Harmonic Distortion Rating: Less than 20 percent, unless noted otherwise.
  3. Transient Voltage Protection: IEEE C62.41, Category A or better.
  4. Operating Frequency: 20 kHz or higher.
  5. Lamp Current Crest Factor: 1.7 or less.
  6. BF: 0.85 or higher.
  7. Power Factor: 0.95 or higher.
  8. Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C 82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.
- B. Electronic Programmed-Start Ballasts for T5 and T5HO Lamps: Comply with ANSI C82.11 and the following:
1. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
  2. Automatic lamp starting after lamp replacement.
  3. Sound Rating: A.
  4. Total Harmonic Distortion Rating: Less than 20 percent.
  5. Transient Voltage Protection: IEEE C62.41, Category A or better.
  6. Operating Frequency: 20 kHz or higher.
  7. Lamp Current Crest Factor: 1.7 or less.
  8. BF: 0.95 or higher, unless otherwise indicated.
  9. Power Factor: 0.95 or higher.
- C. Single Ballasts for Multiple Lighting Fixtures: Factory-wired with ballast arrangements and bundled extension wiring to suit final installation conditions without modification or rewiring in the field.
- D. Ballasts for Low-Temperature Environments:



1. Temperatures 0 Deg F and Higher: Electronic or electromagnetic type rated for 0 deg F starting and operating temperature with indicated lamp types.
  2. Temperatures Minus 20 Deg F and Higher: Electromagnetic type designed for use with indicated lamp types.
- E. Ballasts for Low Electromagnetic-Interference Environments: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for consumer equipment.

#### 2.4 BALLASTS FOR COMPACT FLUORESCENT LAMPS

- A. Description: Electronic programmed rapid-start type, complying with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
1. Lamp end-of-life detection and shutdown circuit.
  2. Automatic lamp starting after lamp replacement.
  3. Sound Rating: A.
  4. Total Harmonic Distortion Rating: Less than 20 percent.
  5. Transient Voltage Protection: IEEE C62.41, Category A or better.
  6. Operating Frequency: 20 kHz or higher.
  7. Lamp Current Crest Factor: 1.7 or less.
  8. BF: 0.95 or higher, unless otherwise indicated.
  9. Power Factor: 0.95 or higher.
  10. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
  11. Ballast Case Temperature: 75 deg C, maximum.

#### 2.5 EMERGENCY FLUORESCENT POWER UNIT

- A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.
1. Emergency Connection: Operate 1 fluorescent lamp(s) continuously at an output of 1100 lumens each. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
  2. Night-Light Connection: Operate one fluorescent lamp continuously.
  3. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
    - a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    - b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
  4. Battery: Sealed, maintenance-free, nickel-cadmium type.
  5. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.

6. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is announced by an integral audible alarm and flashing red LED.

## 2.6 BALLASTS FOR HID LAMPS

- A. Electronic Ballast for Metal-Halide Lamps: Include the following features unless otherwise indicated:
  1. Lamp end-of-life detection and shutdown circuit.
  2. Sound Rating: A.
  3. Total Harmonic Distortion Rating: Less than 15 percent.
  4. Transient Voltage Protection: IEEE C62.41, Category A or better.
  5. Lamp Current Crest Factor: 1.5 or less.
  6. Power Factor: .90 or higher.
  7. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
  8. Protection: Class P thermal cutout.

## 2.7 EXIT SIGNS

- A. Description: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
  1. Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life.
  2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
    - a. Battery: Sealed, maintenance-free, nickel-cadmium type.
    - b. Charger: Fully automatic, solid-state type with sealed transfer relay.
    - c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
    - d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    - e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
    - f. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is announced by an integral audible alarm and flashing red LED.

## 2.8 FLUORESCENT LAMPS

- A. Low-Mercury Lamps: Comply with EPA's toxicity characteristic leaching procedure test; shall yield less than 0.2 mg of mercury per liter when tested according to NEMA LL 1.

- B. T8 rapid-start low-mercury lamps, rated 32 W maximum, nominal length of 48 inches, 2800 initial lumens (minimum), CRI 82 (minimum), color temperature 3500 K, and average rated life 20,000 hours, unless otherwise indicated.
- C. T8 rapid-start low-mercury lamps, rated 17 W maximum, nominal length of 24 inches, 1300 initial lumens (minimum), CRI 82 (minimum), color temperature 3500 K, and average rated life of 20,000 hours, unless otherwise indicated.
- D. T5 rapid-start low-mercury lamps, rated 28 W maximum, nominal length of 45.2 inches, 2900 initial lumens (minimum), CRI 85 (minimum), color temperature 3000 K, and average rated life of 20,000 hours, unless otherwise indicated.
- E. T5HO rapid-start, high-output low-mercury lamps, rated 54 W maximum, nominal length of 45.2 inches, 5000 initial lumens (minimum), CRI 85 (minimum), color temperature 4100 K, and average rated life of 20,000 hours, unless otherwise indicated.
- F. Compact Fluorescent Lamps: 4-Pin, low mercury, CRI 80 (minimum), color temperature 3500 K, average rated life of 10,000 hours at 3 hours operation per start, and where required, suitable for use with dimming ballasts, unless otherwise indicated.
  - 1. 13 W: T4, double or triple tube, rated 900 initial lumens (minimum).
  - 2. 18 W: T4, double or triple tube, rated 1200 initial lumens (minimum).
  - 3. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).
  - 4. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
  - 5. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).
  - 6. 55 W: T4, triple tube, rated 4300 initial lumens (minimum).

## 2.9 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with "Hangers and Supports for Electrical Systems" specification section 260529 for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2 inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, 1/2 inch 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 steel, 12 gauge.
- E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.
- F. Rod Hangers: 3/16 inch 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 GENERAL INSTALLATION REQUIREMENTS

- A. The drawings show the lighting fixture locations as accurately as possible, however the Department reserves the right of final approval of all light fixture locations.
- B. This Contractor shall furnish a complete complement of luminaires and required associated appurtenances, including all lamps and accessory wiring. This Contractor shall provide all labor and materials necessary to assemble, install and test the specified equipment in the manner indicated. Lighting equipment shall be as described herein and detailed on the drawings in the lighting fixture schedule.
- C. Every lighting outlet shall have a lighting fixture unless otherwise directed. In instances where a specific type of light fixture has not been assigned to an outlet, provide a complete light fixture of the type and wattage designed for outlets of similar function and/or type as directed by the Department.
- D. This Contractor shall furnish all necessary additional auxiliary supporting steel for light fixture not mounted on building framework, and where necessary to span the ceiling channels of hung ceiling construction. Where light fixtures are installed in lay-in type ceilings, this Contractor shall be responsible to support light fixtures from building framework. The ceiling system shall not support the light fixtures. Light fixture support wires shall be installed as close to vertical as practical. Each light fixture shall have at least two (2) separate support wires at opposite corners. Light fixture support wire shall be #12 plated steel wire.
- E. Light fixtures and/or fixture outlet boxes shall be provided with hangers to adequately support the complete weight of the light fixture. Design of hangers and method of fastening other than shown on the drawings, or herein specified shall be submitted to the Department for approval.
- F. All plaster frames, channels, clips, yokes, and other necessary materials and hardware for the installation and support of the light fixtures shall be furnished and installed by this Contractor. The outlet boxes shall not be used to support the light fixture. Where fixture studs are used, they shall be the type that are inserted from the back of the box.
- G. Light fixtures mounted on outlet boxes shall be rigidly secured to a fixture stud in the outlet box. Hickies or extension pieces shall be installed where required to facilitate proper installation.
- H. Where light fixtures are installed in an accessible or lay-in type ceiling, junction boxes shall be installed at convenient locations above the ceiling. As approved by the NEC, flexible conduits shall be used to connect the junction boxes and the light fixtures to use for the circuit conductors. Where light fixtures are installed flush with the ceiling line over which the light fixtures shall be mounted, insulated conductors, as approved by the NEC, shall be spliced in through a rubber grommeted knockout.
- I. Flush mounted recessed light fixtures shall be installed so as to completely eliminate light leakage between the frame and the finished surface. Light fixture housing frame or canopy shall provide a suitable cover for the light fixture outlet box or opening.

- J. This Contractor shall confirm the type of ceiling construction. This Contractor shall be responsible for ordering the proper light fixtures with hardware for installation in or on the specified ceiling, which shall include all necessary and required plaster frames.
- K. Unless specifically noted in the light fixture specification, the finish exposed metal surfaces shall be baked white enamel or satin aluminum. As specified, all recessed light fixtures shall be of size to fit structural conditions. All recessed light fixtures shall be equipped with frames and accessories required to fit the ceiling construction in which they occur, whether or not they are included in the individual light fixture specifications.
- L. When recessed lighting fixtures are installed in fire resistant type suspended ceiling construction, they shall be furnished with fireproof boxes of materials with the same fire rating as the ceiling panels in conformance with the building materials list of the Underwriters' Laboratory, Inc. Minimum clearance between the lighting fixture and the fireproofing box shall be 6".
- M. Clean lighting fixtures of dirt and debris upon completion of installation and protect installed fixtures from damage during remainder of construction period.
- N. Upon completion of installation of lighting fixtures, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

### 3.2 INSTALLATION

- A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Suspended Lighting Fixture Support:
  - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
  - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
  - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
- C. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.
- D. Adjust aimable lighting fixtures to provide required light intensities.

### 3.3 FIELD QUALITY CONTROL

- A. Test lighting system to demonstrate compliance with design intent and lighting standards. Correct any deficiencies identified and retest.
- B. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

END OF SECTION 265100

SCHEDULE OF MATERIAL SUBMITTALS													PROJECT NUMBER			PROJECT TITLE											
Electrical Submittals *													DMVA 42160105			Lock Haven FMS HVAC & Exhaust Replacement											
ITEM NUMBER	ITEM OR DESCRIPTION OF ITEM, CONTRACT REFERENCE, TYPE OF SUBMITTAL	NUMBER OF COPIES REQUIRED											REQUIRED SUBMISSION DATE	DATE RECEIVED IN CONTRACTING	DATE TO ENGINEERING AND ARCHITECTURE	DATE TO CONTRACTING FROM E&A	DATE CONTRACTOR NOTIFIED				RESUBMITTAL				REMARKS		
		CERTIFICATE OF COMPLIANCE	SHOP DRAWINGS	SAMPLES	COLOR SELECTION	MANUFACTURER'S RECOMMENDATIONS	MANUFACTURER'S WARRANTY	CATALOG DATA	OPERATING INSTRUCTIONS	REPORTS	BATCH SLIPS	STEEL CERTIFICATIONS					ACCEPTED	ACCEPTED AS NOTED	REVISE & RESUBMIT	NOT ACCEPTED	DATE OF RESUBMITTAL TO CONTRACTING	DATE OF RESUBMITTAL TO E&A	DATE OF RESUBMITTAL TO CONTRACTING FROM E&A	DATE OF FINAL APPROVAL			
4	260519 – Low-Voltage Electrical Power Conductors & Cables, Conductors and Cables, and Connectors & Splices						5						NTP +10														
5	260526 – Grounding & Bonding for Electrical Systems, Grounding Conductors, Connectors, Grounding Electrodes, & Conduit Ground Bushings						5						NTP +10														
7	260533 – Raceway and Boxes for Electrical Systems, Metal Conduit and Tubing						5				5		NTP +10														
8	260533 – Raceway and Boxes for Electrical Systems, Boxes, Enclosures, Cabinets, and Sleeves for Raceway						5				5		NTP +10														
9	260553 – Identification for Electrical Systems, Identification Materials						5						NTP +10														
11	262416 – Panelboards		5				5				5		NTP +30														
12	262726 – Wiring Devices						5						NTP +10														
13	262813 – Fuses				5		5						NTP +10														
17	265100 – Interior Lighting		5				5				5		NTP +10														
19	271500 – Communications Horizontal Cabling, UTP Cable, and Hardware						5						NTP +10														
20	271500 – Communications Horizontal Cabling, Testing								5																		
21	262713 – Electricity Metering		5			5	5						NTP +10														

\* NOTE: This form is provided for contract compliance and does not alleviate any requirements stated in the specifications. “NTP” – Notice to Proceed. Combine submittals where appropriate, line items are shown for control only.



# COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF GENERAL SERVICES

HARRISBURG, PENNSYLVANIA

TOM WOLF, GOVERNOR

CURT TOPPER, SECRETARY

## PROJECT NO. D.G.S. A962-58 PHASE 1 HVAC & EXHAUST REPLACEMENT

LOCK HAVEN FMS  
LOCK HAVEN, CLINTON COUNTY, PENNSYLVANIA

DESIGN PROFESSIONALS  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS  
BUREAU OF MILITARY CONSTRUCTION AND ENGINEERING  
BLDG. 0-10, CHAPEL ROAD, FT. INDIANTOWN GAP  
ANNVILLE, LEBANON COUNTY, PENNSYLVANIA

### INDEX TO DRAWINGS

G.1.0 COVER SHEET  
G.1.1 PROJECT INFORMATION

GENERAL CONSTRUCTION  
CONTRACT NO. D.G.S. A962-58.1

CIVIL DWGS.  
C.1.0 EXISTING SITE PLAN  
C.2.0 NEW SITE PLAN

ARCHITECTURAL DWGS.  
A.1.1 FLOOR PLAN  
A.2.1 ELEVATIONS & DETAILS  
A.3.1 RESTROOMS & DETAILS  
A.4.1 DOORS & DETAILS

HVAC CONSTRUCTION  
CONTRACT NO. D.G.S. A962-58.2

HVAC DWGS.  
H.1.1 HVAC PLANS  
H.2.1 SCHEDULES & DETAILS

PLUMBING CONSTRUCTION  
CONTRACT NO. D.G.S. A962-58.3

PLUMBING DWGS.  
P.1.1 PLUMBING DEMO PLANS  
P.2.1 PLUMBING NEW PLANS  
P.3.1 SCHEDULES & DETAILS

### UCC BUILDING APPROVAL

These plans are deemed in compliance with the Pennsylvania Construction Code Law (1999, November 10, P.L. 491, NO. 45) and its regulations.

Plan Code: B File Number: 532391 Permit Number: 201800635

Constr Type: 3B Story Height: 1 BSMT:

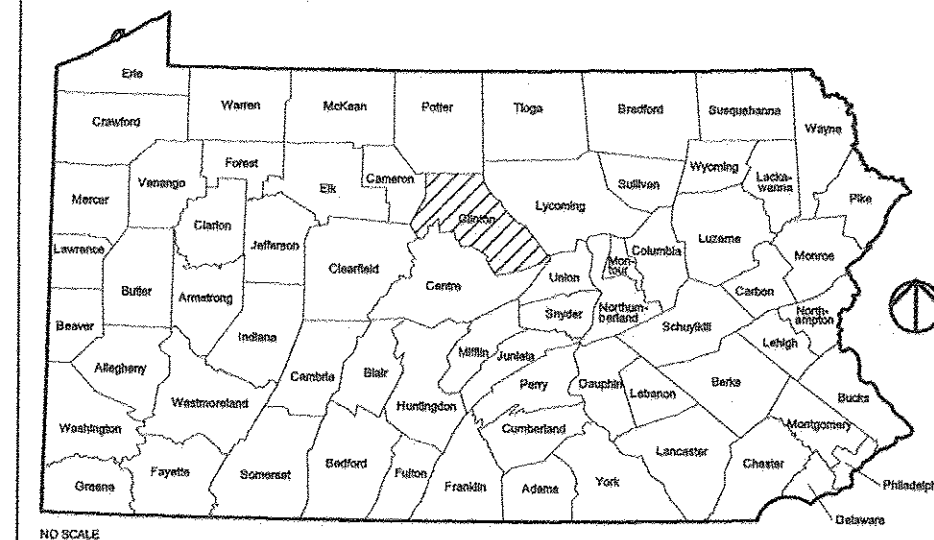
Occupancy(s):	B	F	S	1		
TYPE REV	BLDG	ELEC	MECH	PLUM	ENERGY	ACCESS
	X	X	X	X	X	X

Fire Protection:  
Special Inspections: N EL(Y)  
Code Edition: 2009/2015 Number of Sheets: 15  
PRIMARY EXAMINER: Lehmer, Timothy A Date: 5/29/2018

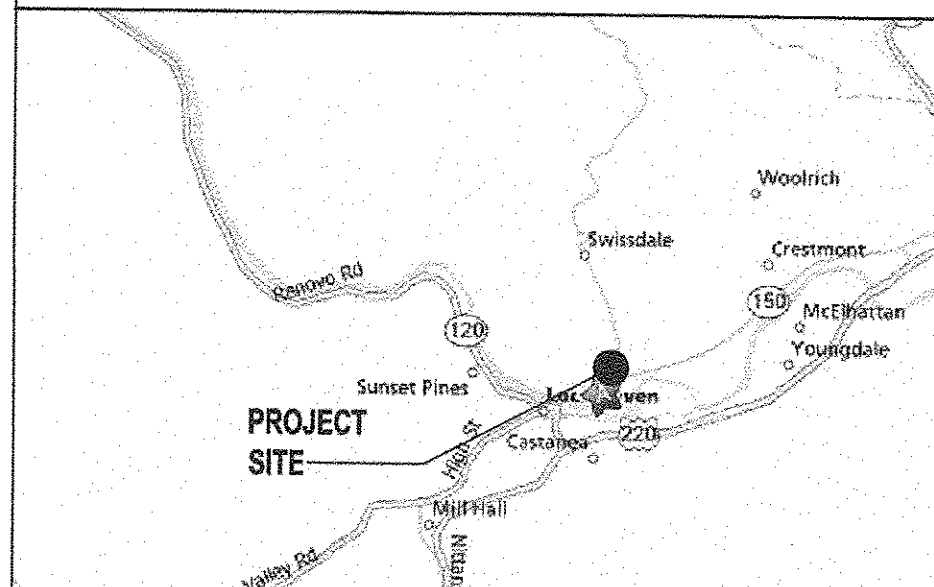
*Tim Lehmer*

#### CODE APPROVALS

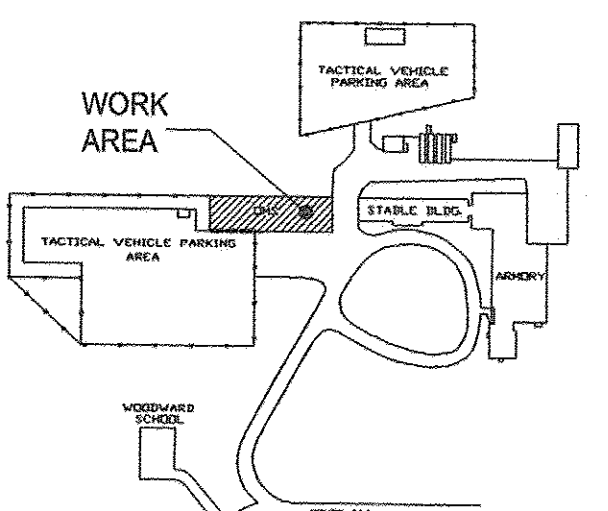
#### PROJECT LOCATION MAP



#### VICINITY MAP

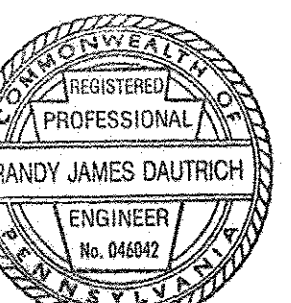


#### CAMPUS / KEY PLAN



Drawings Listed In Index:

APPROVED \_\_\_\_\_ DATE \_\_\_\_\_  
Department of General Services



*Christian Peter Kita* 4/13/18 *Randy James Dautrich* 4/13/18  
Professional's Signature Date Professional's Signature Date

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS  
BUREAU OF MILITARY CONSTRUCTION AND ENGINEERING  
BLDG. 0-10, FORT INDIANTOWN GAP  
ANNVILLE, LEBANON COUNTY, PENNSYLVANIA

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF GENERAL SERVICES  
HARRISBURG, PENNSYLVANIA

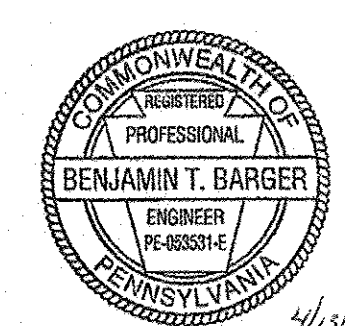
PROJECT NO. D.G.S. A962-58 PH. 1  
DMVA PROJECT NO. 42160105

HVAC & EXHAUST  
REPLACEMENT  
LOCK HAVEN FMS  
CLINTON COUNTY, LOCK HAVEN, PENNSYLVANIA

#### COVER SHEET

DRAWN BY R. FISHBURN	DATE 13 APRIL 2018	DRAWING NO. G.1.0
CHECKED BY R. DAUTRICH	SCALE AS NOTED	

SEE NOTES ON  
A.3.1  
A.4.1





# BUILDING CODE AND STANDARDS ANALYSIS

**GENERAL INFORMATION:**

OCCUPANCY GROUP:	"S-1" STORAGE "B" BUSINESS "F-1" FACTORY / INDUSTRIAL
TYPE OF CONSTRUCTION:	TYPE IIIB
ALLOWABLE HEIGHT AND BUILDING AREA:	
ALLOWABLE HEIGHT:	2 STORIES
ACTUAL HEIGHT:	1 STORY
ALLOWABLE AREA:	"B" 19,000 SQ. FT. PER FLOOR
ACTUAL AREA:	3600 SQ. FT.
ALLOWABLE AREA:	"F-1" 19,000 SQ. FT. PER FLOOR
ACTUAL AREA:	5400 SQ. FT.
ALLOWABLE AREA:	"S-1" 19,000 SQ. FT. PER FLOOR
ACTUAL AREA:	1200 SQ. FT.
TOTAL AREA:	10,200 SQ. FT.
FIRE RESISTANCE RATING REQUIRED FOR:	TYPE IIIB
STRUCTURAL FRAME:	0 - HOUR
BEARING WALLS EXTERIOR:	2 - HOUR
BEARING WALLS INTERIOR:	0 - HOUR
NON-BEARING WALLS EXTERIOR:	0 - HOUR
NON-BEARING WALLS INTERIOR:	0 - HOUR
FLOOR CONSTRUCTION:	0 - HOUR
ROOF CONSTRUCTION:	0 - HOUR
"S-1" OCCUPANT LOAD: 300 SQ.FT. PER OCCUPANT	1200 TOTAL SQ. FT.
ALLOWABLE "S-1" OCCUPANTS:	4
"B" OCCUPANT LOAD: 100 SQ.FT. PER OCCUPANT	3600 TOTAL SQ. FT.
ALLOWABLE "B" OCCUPANTS:	36
"F-1" OCCUPANT LOAD: 100 SQ.FT. PER OCCUPANT	5400 TOTAL SQ. FT.
ALLOWABLE "F-1" OCCUPANTS:	54
TOTAL OCCUPANT LOAD	94

**EGRESS INFORMATION:**

IBC 1005.1 EGRESS WIDTH PER OCCUPANT:	0.2 INCHES PER OCCUPANT
BUILDING OCCUPANCY:	94 person @ 0.2 = 18.8 INCHES
<b>ACTUAL EGRESS WIDTHS:</b>	
MAIN ENTRANCE:	36 INCHES
SIDE ENTRANCE:	36 INCHES
FRONT ENTRANCE:	36 INCHES
1021.1 NUMBER OF EXITS:	1-500 OCCUPANTS = 2 EXITS MINIMUM

## GENERAL NOTES

- CONTRACTOR SHALL VERIFY FIELD CONDITIONS AND DIMENSIONS AND REPORT DISCREPANCIES TO GOVERNMENT DESIGN PROFESSIONAL PRIOR TO COMMENCEMENT OF WORK.
- EXTERIOR DIMENSIONS SHOWN ON DRAWINGS ARE FINISHED FACE TO FINISHED FACE, UNLESS DEPICTED OTHERWISE.
- INTERIOR DIMENSIONS SHOWN ON DRAWINGS ARE CENTER OF WALL TO CENTER OF WALL, UNLESS DEPICTED OTHERWISE.
- DETAILS ARE TYPICAL AND SHOW COMMON PRACTICE. CONTRACTOR SHALL INCORPORATE THESE DETAILS INTO THE PROJECT AT APPROPRIATE LOCATIONS WHERE CONDITIONS ARE SIMILAR AND WHETHER SPECIFICALLY INDICATED OR NOT.
- DRAWINGS DEPICT COMMON PRACTICES AND ARE DIAGRAMMATIC, CONTRACTOR SHALL BE RESPONSIBLE FOR THE INSTALLATION OF ALL NECESSARY COMPONENTS NEEDED FOR A COMPLETE AND FUNCTIONAL FACILITY.
- CONTRACTOR SHALL BE RESPONSIBLE FOR FOLLOWING ALL APPLICABLE CODE REGULATIONS. ASPECTS NOT DETAILED WITHIN THE DESIGN DOCUMENTS SHALL BE INCORPORATED AS NECESSARY TO MEET ALL GOVERNING CODE REQUIREMENTS.
- GENERAL ("PRIME") CONTRACTOR IS RESPONSIBLE FOR COORDINATION OF WORK WITH THAT OF ALL OTHER TRADES.

## DRAWING INTERPRETATION

DETAILS INDICATED ON THE DRAWINGS, BOTH TYPICAL (TYP.) AND SPECIFIC, SHALL APPLY TO ALL SITUATIONS OCCURRING ON THE PROJECT THAT ARE THE SAME OR SIMILAR TO THOSE SPECIFICALLY DETAILED. THE APPLICABILITY OF THE DETAIL TO ITS LOCATION ON THE PLANS CAN BE DETERMINED BY THE TITLE OF THE DETAIL. SUCH DETAILS SHALL APPLY WHETHER OR NOT THEY ARE KEYED AT EACH LOCATION. DECISIONS REGARDING THE APPLICABILITY OF DETAILS SHOWN SHALL BE DETERMINED BY THE GOVERNMENT DESIGN PROFESSIONAL AND/OR THE GOVERNMENT CONSTRUCTION MANAGEMENT SPECIALIST.

## SYMBOLS

DETAIL REFERENCE SECTION NUMBER		WALL REFERENCE	
SHEET NUMBER		DOOR TYPE SYMBOL	
ENLARGED DWG. REFERENCE DETAIL NUMBER		DEMO NOTE	
SHEET NUMBER		WALL ID SYMBOL	
ELEVATION REFERENCE ELEVATION NUMBER			
SHEET NUMBER			
SECTION REFERENCE ELEVATION NUMBER			
SHEET NUMBER			

## LEGEND

	MASONRY WALL
	CONCRETE
	GROUT, GYPSUM SHEETING
	STEEL
	STONE, GRAVEL FILL
	EARTH

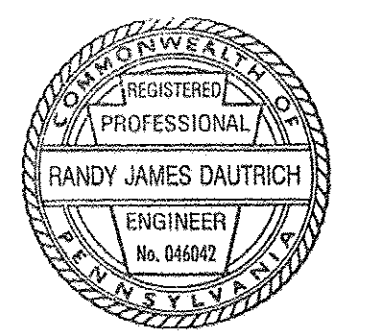
## ABBREVIATIONS

ARCHITECTURAL			
ACT.	ACOUSTICAL TILE	GYP.	GYPSUM
AC	AIR CONDITIONING	HM.	HOLLOW METAL
ALUM.	ALUMINUM	HW.C.	HIGH IMPACT WALL COVERING
BLDG.	BUILDING	INSUL.	INSULATION
C.J.	CONTROL JOINT	K.C.J.	KEYWAY CONSTRUCTION JOINT
CLG. HT.	CEILING HEIGHT	M.C.	MECHANICAL CONTRACTOR
CLO.	CLOSET	MIN.	MINIMUM
COLS.	COLUMNS	NTS.	NOT TO SCALE
CMJ.	CONCRETE MASONRY UNIT	O/C	ON CENTER
DEMO.	DEMOLITION	OSB.	ORIENTED STRAND BOARD
DN.	DOWN	PC.	PLUMBING CONTRACTOR
EIFS	EXTERIOR INSULATION FINISH SYSTEM	PE.	PROFESSIONAL ENGINEER
ELV.	ELEVATION	RA.	REGISTERED ARCHITECT
EC.	ELECTRICAL CONTRACTOR	REQ.	REQUIRED
FD.	FLOOR DRAIN	RM.	ROOM
FE.	FIRE EXTINGUISHER	SHTG.	SHEETING
FEC.	FIRE EXTINGUISHER CABINET	SLD. CONC.	SOLID CONCRETE
FF.	FINISHED FLOOR	SPF.	SPRUCE-PINE-FIR
FURR.	FURRED	SYP.	SOUTHERN YELLOW PINE
GC.	GENERAL CONTRACTOR	TYP.	TYPICAL
GR.	GRADE	VCB.	VINYL COMPOSITION BASE
GA.	GAGE	VCT.	VINYL COMPOSITION TILE
GWB	GYPSUM WALL BOARD		

## CODE AND STANDARD COMPLIANCE

- GENERAL BUILDING CODE:**
- INTERNATIONAL BUILDING CODE (2009)
- MECHANICAL:**
- INTERNATIONAL MECHANICAL CODE (2009)
  - INTERNATIONAL PLUMBING CODE (2009)
  - INTERNATIONAL FUEL GAS CODE (2009)
  - ASHRAE 90.1 - AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR CONDITIONING ENGINEERS
- ELECTRICAL CODE:**
- NATIONAL ELECTRICAL CODE (2008)
  - INTERNATIONAL ENERGY CONSERVATION CODE (2009)
- FIRE AND SAFETY:**
- INTERNATIONAL FIRE CODE (2009)
  - NFPA 101, LIFE SAFETY CODE (2009)
  - OSHA - OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
- TESTING AND MATERIALS:**
- ASTM - AMERICAN SOCIETY FOR TESTING AND MATERIALS
  - UL - UNDERWRITER LABORATORIES

NO.	DESCRIPTION	DATE
REVISIONS		



*Randy J. Dautrich 4/13/18*  
Professional's Signature Date

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS  
BUREAU OF MILITARY CONSTRUCTION AND ENGINEERING  
BLDG. 0-10, FORT INDIANTOWN GAP  
ANNVILLE, LEBANON COUNTY, PENNSYLVANIA

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF GENERAL SERVICES  
HARRISBURG, PENNSYLVANIA

PROJECT NO. D.G.S. A962-58 PH.1  
DMVA PROJECT NO. 42160105

## HVAC & EXHAUST REPLACEMENT

LOCK HAVEN FMS  
CLINTON COUNTY, LOCK HAVEN, PENNSYLVANIA

## PROJECT INFORMATION

### VERIFY SCALE

BAR IS ONE (1) INCH LONG ON ORIGINAL DRAWING:

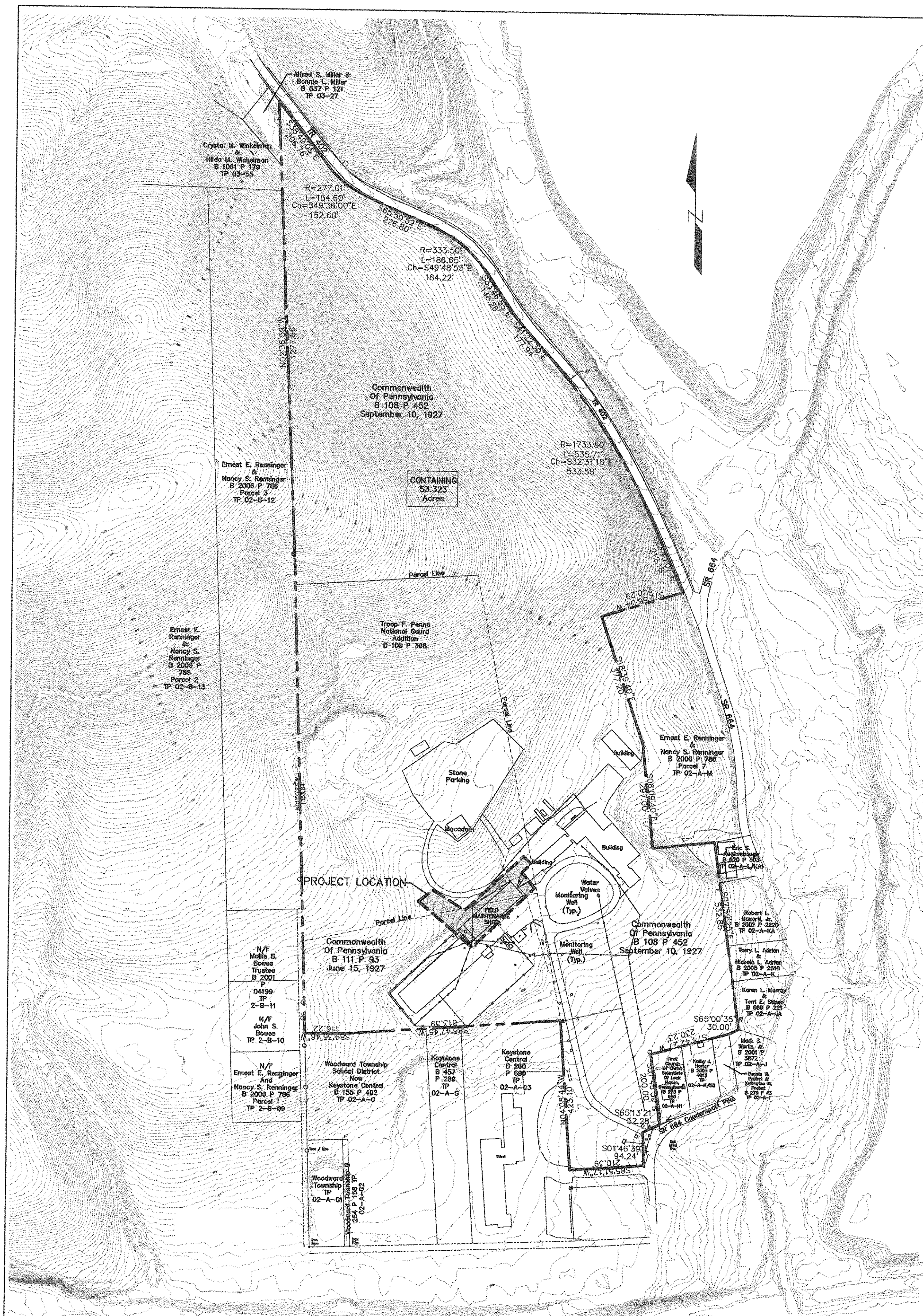
0 1

IF BAR IS NOT ONE (1) INCH LONG, ADJUST SCALE ACCORDINGLY

CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS. VARIANCE FROM CONTRACT DOCUMENTS NOT PERMITTED WITHOUT BUREAU OF ENGINEERING AND ARCHITECTURE APPROVAL.

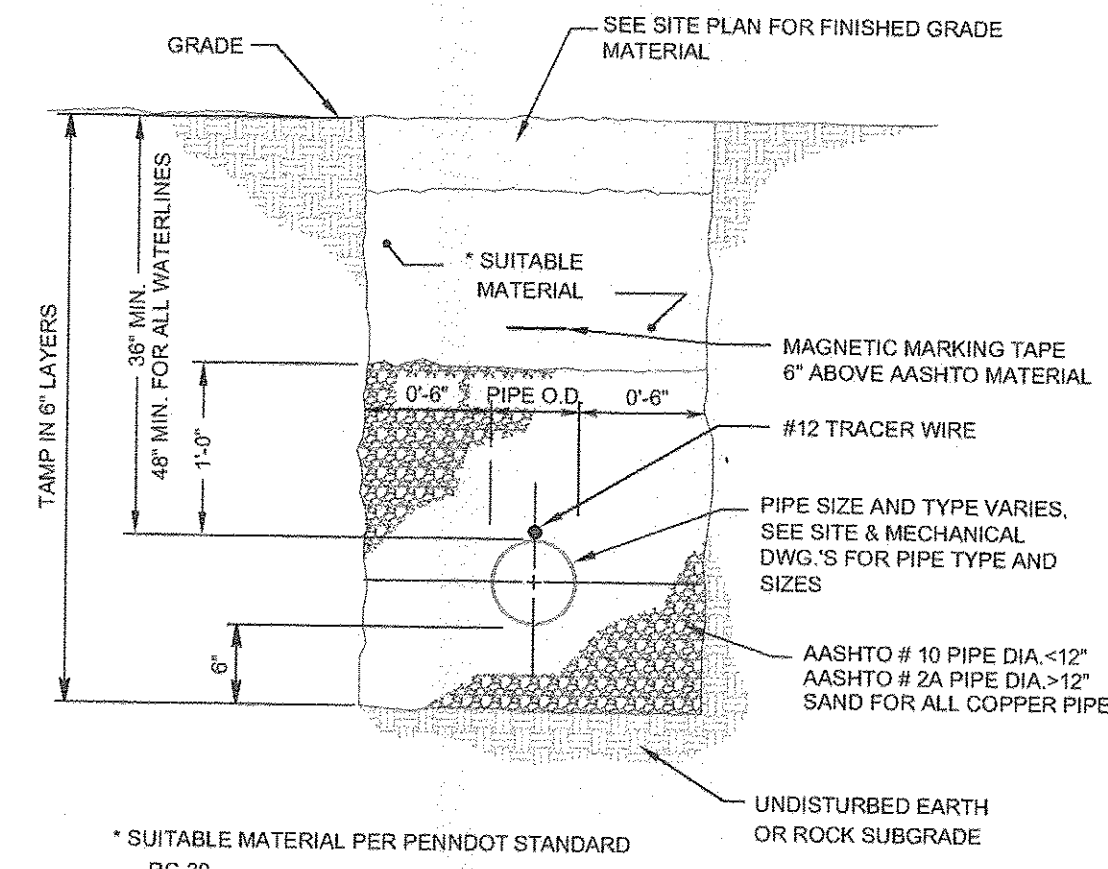
DRAWN BY	DATE	DRAWING NO.
R. FISHBURN	13-APRIL-2018	G.1.1
CHECKED BY	SCALE	
R. DAUTRICH	AS NOTED	





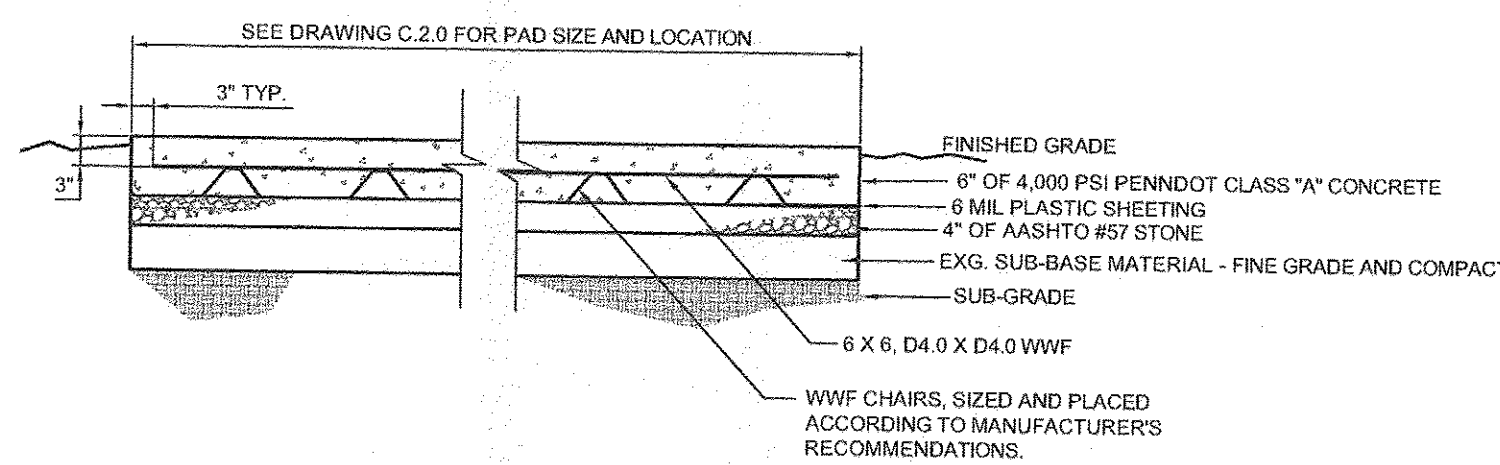
**EXISTING SITE PLAN**

SCALE: 1" = 200'  
SCALE IN FEET



**2 PIPE TRENCH SECTION - TYPICAL**

C.1.0 NOT TO SCALE



**3 ADA CONCRETE ACCESS PAD**

C.1.0 NOT TO SCALE

**Statement of Work**  
Removal of 2 Ea. 1,000 Gallon Heating Oil AST's  
Department of Military and Veterans Affairs (DMVA)  
PAARNG Lock Haven Facility, Lock Haven, PA 17445

**I. SCOPE OF WORK**

Services shall include, but not be limited to, the furnishing of all materials, labor, equipment, tools, transportation, supervision, licenses, certifications, permits, and miscellaneous items to perform all tasks necessary to remove, transport, recycle, and dispose of all materials associated with the heating oil tank in accordance with this Statement of Work (SOW), all local, state, federal, Department of Defense (DOD), Installation, and Army requirements, and to the approval of the DMVA.

The contractor is required to make an effort to utilize any recycling option that is economical for the project. All scrap materials and other items not identified by the DMVA for salvage shall become the property of the contractor. All revenue generated from the sale of said materials shall accrue to the contractor.

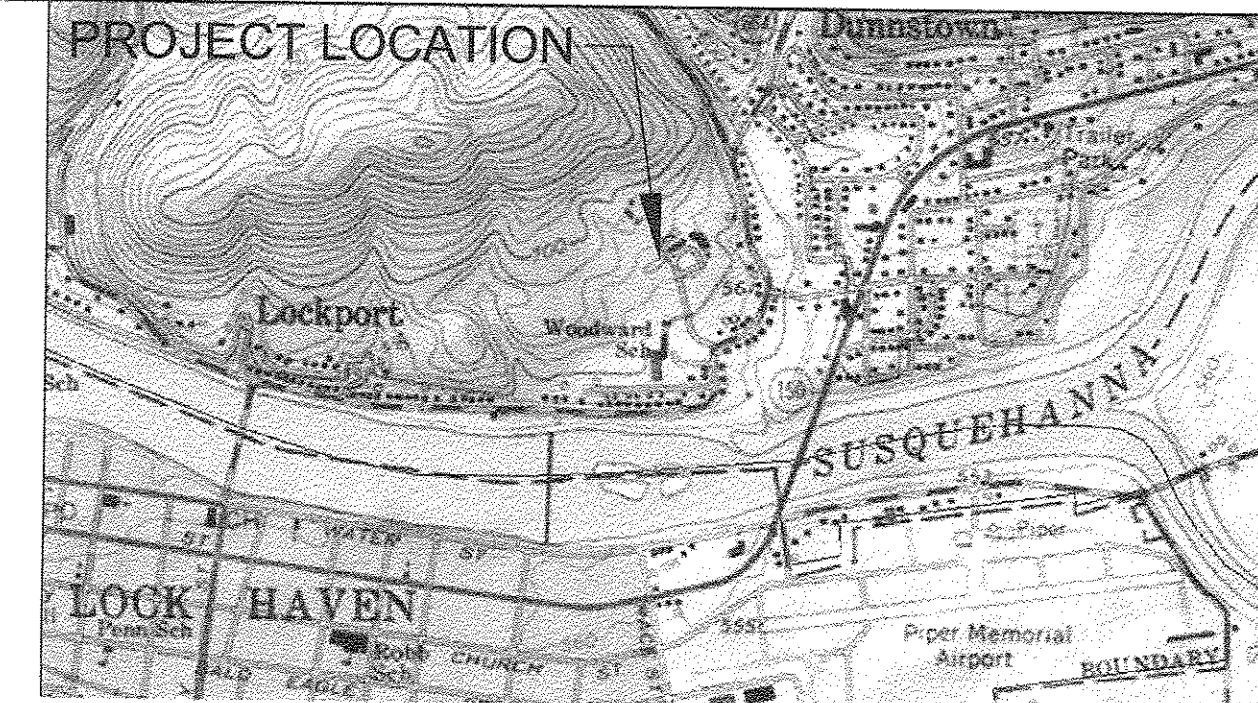
- A. The Contractor is responsible for removing any oil remaining in the storage tanks and cleaning the 2 Ea. 1,000 gallon heating oil tanks in a manner that prevents spillage on adjacent surfaces and areas and legally dispose of any remaining residue/sludge from the tank in accordance with all applicable federal, state, local, Department of Defense (DOD), and Army requirements. The Contractor shall provide a copy of any waste analysis and manifest/shipping paper to the DMVA within 10 days of disposal.
- B. The contractor shall disconnect and remove any above ground or buried piping associated with each of the storage tanks.
- C. The Contractor shall properly and legally recycle or dispose of the storage tank and all associated piping and appurtenances in accordance with all applicable federal, state, local, Department of Defense (DOD), and Army requirements. The Contractor shall provide all scrap metal recycling/disposal receipts to the DMVA within 10 days of completion of this contract.
- D. The Contractor shall initiate cleanup action of any spill immediately upon discovery, and shall immediately report any spills or releases of any hazardous material or hazardous substance on the installation that cannot be safely or effectively stopped and cleaned by the Contractor to the Emergency Service call center by phoning 911. The Contractor shall be solely responsible for any spills or releases which occur as the result of the actions of its agents and/or personnel during the performance of this contract. Contractor shall clean any spill or release to the satisfaction of the DMVA in a manner that complies with applicable federal, state, and local regulations. Clean up shall be at no cost to the government.
- E. The Contractor shall take all reasonable precautions in the performance of the work under this contract to protect the safety and health of employees, members of the public and to protect the environment. This includes compliance with all applicable environmental, safety, and health regulations.

**1 EXISTING HEATING OIL TANK REMOVAL**

C.1.0 NOT TO SCALE

**SITE / CIVIL LEGEND**

EXISTING	PROPOSED	
450	[450]	CONTOUR LINE
SS	SS	SANITARY SEWER
W	W	WATER LINE
Eux	E	ELECTRIC - UNDERGROUND
E	E	ELECTRIC - OVERHEAD
—	—	FENCELINE
—	—	COMMUNICATION - UNDERGROUND
—	—	NATURAL GAS
—	—	STORM SEWER
—	—	EROSION FILTER SOCK
—	—	LIMIT OF DISTURBANCE
—	—	NATURAL GAS SHUTOFF VALVE
—	—	W/ CURB STOP ENCLOSURE
—	—	WATER VALVE
△	△	MANHOLE
△	△	BENCHMARK ELEVATION
△	△	SPOT ELEVATION
△	△	BENCHMARK ELEVATION
—	—	FLOW ARROW
—	—	TEMPORARY ROCK FILTER
—	—	UTILITY POLE
—	—	FIRE HYDRANT
—	—	CONCRETE HATCH
—	—	TREE
—	—	EROSION CONTROL MATTE
—	—	POLE MOUNTED AREA LIGHTING
—	—	GROUND MOUNTED FLOODLIGHT
—	—	STORM INLET
—	—	RIP-RAP
—	—	DEMOLITION AREA
—	—	NEW BITUMINOUS AREA
—	—	COMPACTED GRAVEL AREA



**LOCATION MAP**

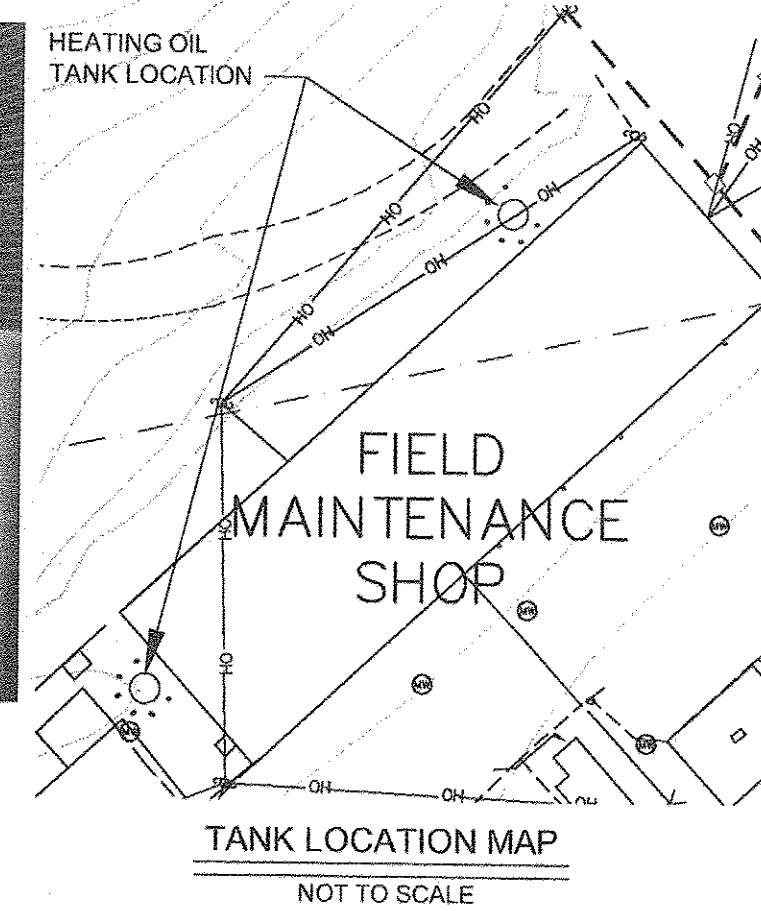
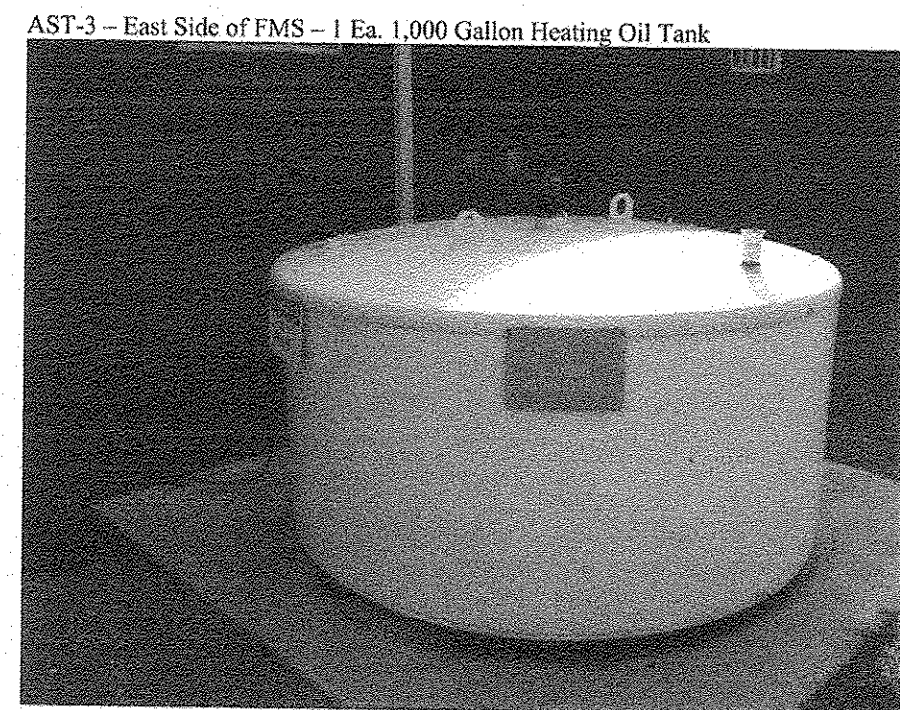
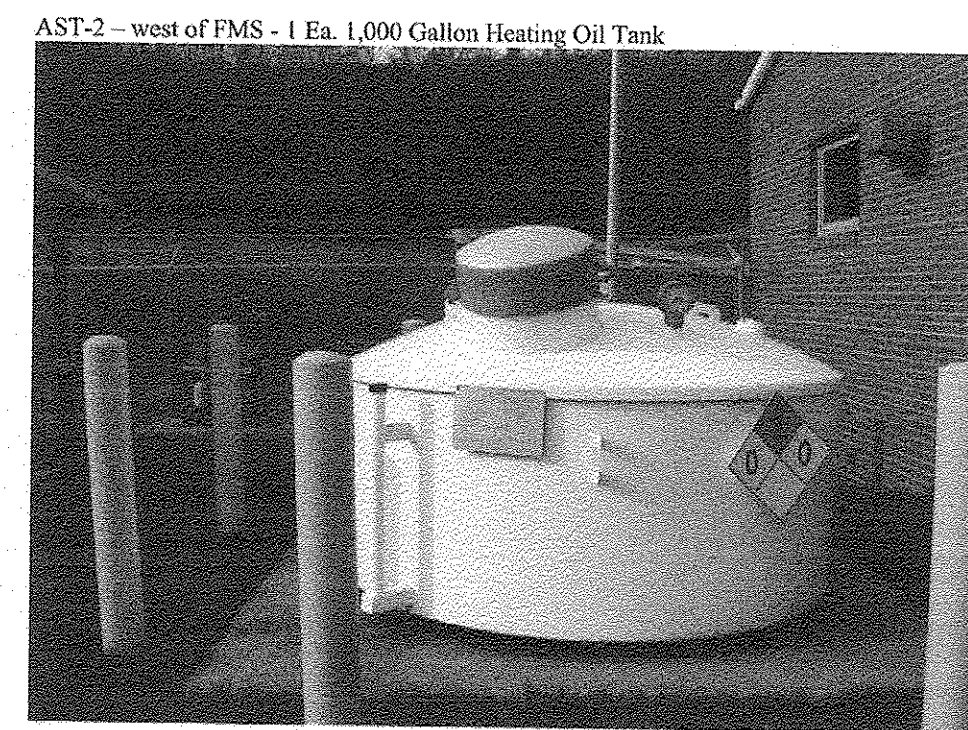
SCALE: 1" = 2,000'  
SCALE IN FEET

**GENERAL NOTES:**

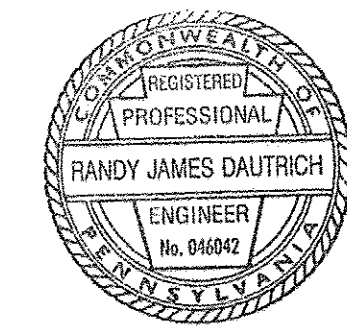
- EXISTING SITE PLAN WAS PROVIDED FROM A PROJECT FOR THE DEPARTMENT OF MILITARY AND VETERANS AFFAIRS, No. C-42000-08-011 BY HAWBAKER CONSTRUCTION SERVICES, LLC., JOB No. 08-914, DRAWING DATED 12 MARCH 2008. ADDITIONAL SPECIFIC TOPOGRAPHIC INFORMATION FOR THIS PROJECT WAS OBTAINED BY THE DEPT. OF MILITARY AND VETERANS AFFAIRS, DIVISION OF ENGINEERING AND ARCHITECTURE, USING GPS/RTK SURVEY. DATUM REFERENCE IS PA STATE PLANE COORDINATES, 18-SOUTH, NAD-83 & NAVD-88.
- A "PA ONE CALL" WAS ACCOMPLISHED DURING THE DESIGN PHASE OF THIS PROJECT. THE CONTRACTOR IS RESPONSIBLE TO COMPLETE A "PA ONE CALL" AND VERIFY LOCATION OF ALL EXISTING UTILITIES PRIOR TO START OF EXCAVATION OPERATIONS.
- THE CONTRACTOR IS RESPONSIBLE TO REPLACE, AT NO ADDITIONAL COST TO THE GOVERNMENT, ANY AND ALL EXISTING FACILITIES DAMAGED OR DESTROYED DURING THIS PROJECT, EXCEPT THOSE IDENTIFIED TO BE DEMOLISHED AND REMOVED AS PART OF THIS PROJECT.

**SITE INFORMATION:**

- ZONING = R-L LOW DENSITY RESIDENTIAL DISTRICT
- DEED = BOOK 108, PAGE 452, DATED 10 SEPTEMBER 1927.
- ACREAGE = 53.323 ACRES



NO.	DESCRIPTION	DATE
	REVISIONS	



*Randy J. Dautrich* 4/13/18  
Professional's Signature Date

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS  
BUREAU OF MILITARY CONSTRUCTION AND ENGINEERING  
BLDG. 0-10, FORT INDIANTOWN GAP  
ANVILLE, LEBANON COUNTY, PENNSYLVANIA

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF GENERAL SERVICES  
HARRISBURG, PENNSYLVANIA

PROJECT NO. D.G.S. **A962-58 PH.1**  
DMVA PROJECT NO. 42160105

**HVAC & EXHAUST REPLACEMENT**

LOCK HAVEN FMS, 66 ARMORY RD., WOODWARD TWP.  
CLINTON CO., LOCK HAVEN, PENNSYLVANIA, 17445-0501

**EXISTING SITE PLAN**

**VERIFY SCALE**

BAR IS ONE (1) INCH LONG ON ORIGINAL DRAWING:  
0 1  
IF BAR IS NOT ONE (1) INCH LONG, ADJUST SCALE ACCORDINGLY

CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS. VARIANCE FROM CONTRACT DOCUMENTS NOT PERMITTED WITHOUT BUREAU OF ENGINEERING AND ARCHITECTURE APPROVAL.

DRAWN BY <b>K. LLOYD</b>	DATE <b>13 APRIL 2018</b>	DRAWING NO. <b>C.1.0</b>
CHECKED BY <b>R. DAUTRICH</b>	SCALE <b>AS NOTED</b>	

**CALL BEFORE YOU DIG!**

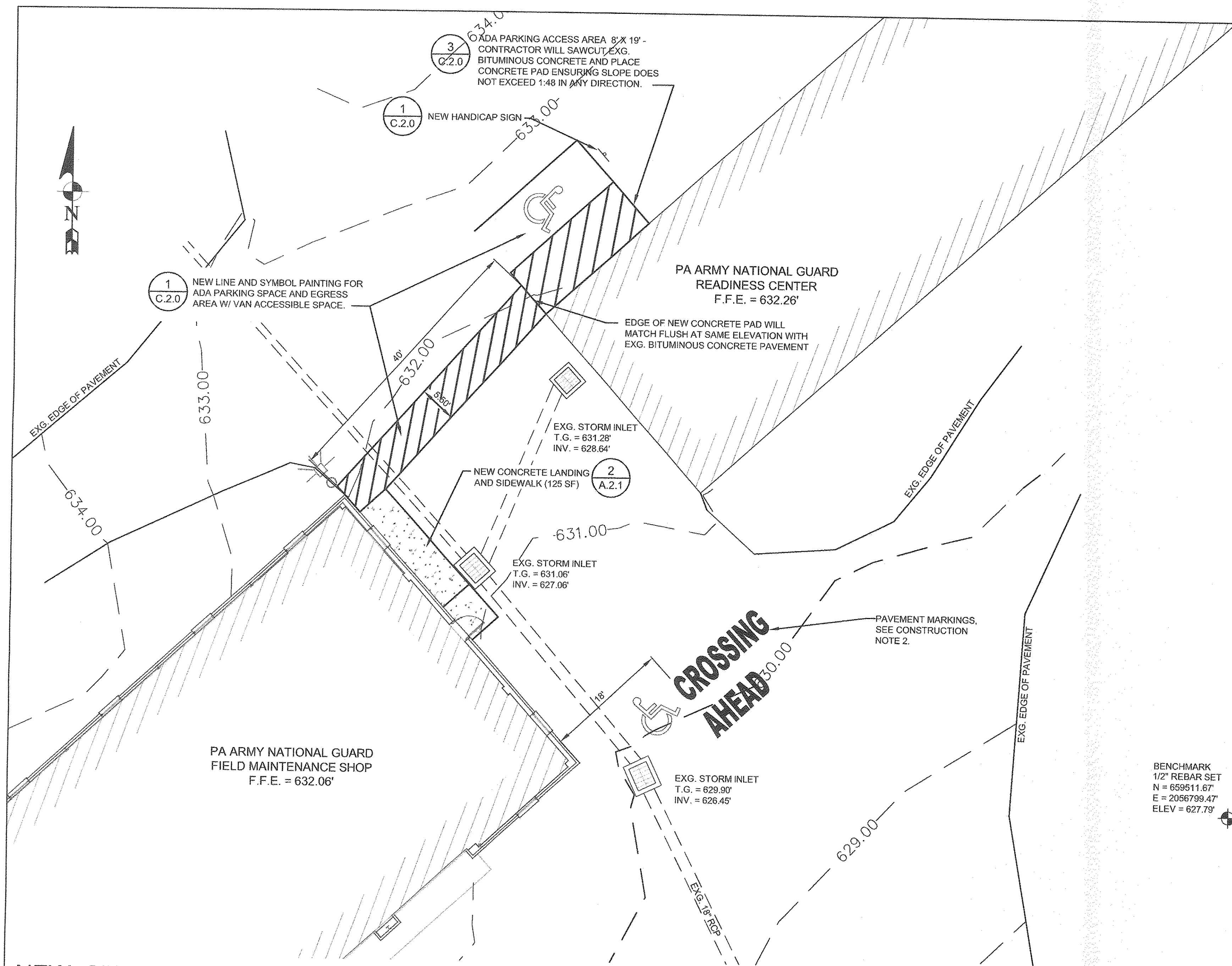
PENNSYLVANIA LAW REQUIRES 3 WORKING DAYS NOTICE FOR CONSTRUCTION PHASE AND 10 WORKING DAYS IN DESIGN STAGE - STOP CALL

POCS SERIAL NUMBER  
**20181143005 (DESIGN)**



1-800-242-1776





**GENERAL NOTES:**

- EXISTING SITE PLAN WAS PROVIDED FROM A PROJECT FOR THE DEPARTMENT OF MILITARY AND VETERANS AFFAIRS, No. C-4200-08-011 BY HAWBAKER CONSTRUCTION SERVICES, LLC, JOB No. 08-914, DRAWING DATED 12 MARCH 2009. ADDITIONAL SPECIFIC TOPOGRAPHIC INFORMATION FOR THIS PROJECT WAS OBTAINED BY THE DEPT. OF MILITARY AND VETERANS AFFAIRS, DIVISION OF ENGINEERING AND ARCHITECTURE, USING GPS/RTK SURVEY. DATUM REFERENCE IS PA STATE PLANE COORDINATES, 18-SOUTH, (NAD-83 & NAVD-88).
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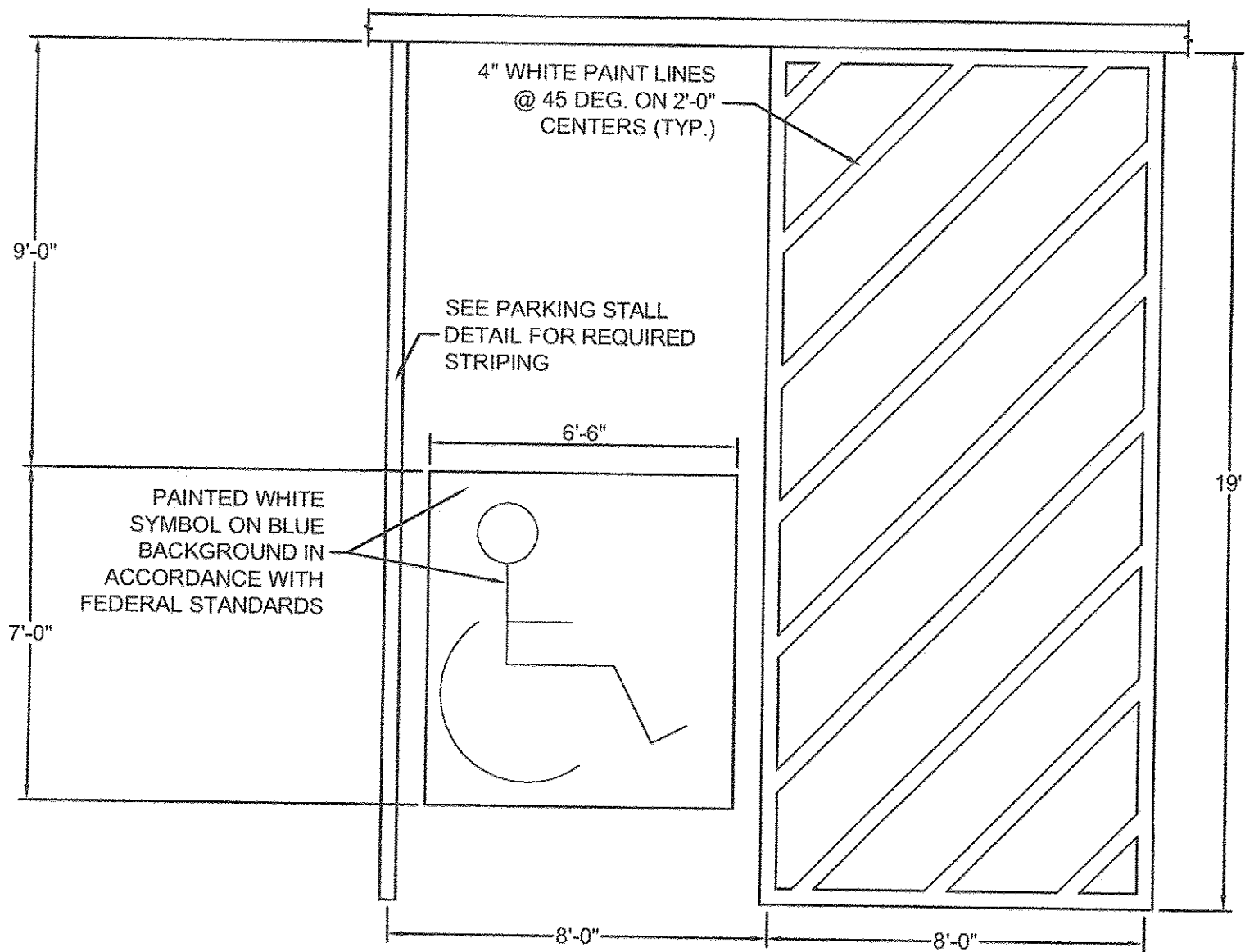
**CONSTRUCTION NOTES:**

- PAVEMENT MARKINGS:
  - LETTERS WILL BE 4" HIGH AND IN ACCORDANCE WITH THE FEDERAL HIGHWAY ADMINISTRATION MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), STANDARD HIGHWAY SIGNS AND MARKING BOOK (SHSM).
  - HANDICAP SYMBOL WILL MATCH DETAIL 1, THIS SHEET. SYMBOL WILL BE CENTERED ON DIRECTION OF TEXT AND RIGHT EDGE OF SYMBOL WILL BE PLACED 1.5' AWAY FROM 1ST LETTER.
  - TOP EDGE OF LETTERING WILL BE ALIGNED WITH SOUTHERN EDGE OF FIELD MAINTENANCE SHOP.
- THE GENERAL CONTRACTOR WILL BE REQUIRED TO INSTALL STEEL/CONCRETE BOLLARDS AROUND PROPANE TANK PAD. TO INCLUDE ALL WORK ASSOCIATED WITH THE COMPLETE INSTALLATION. SEE PLUMBING DRAWINGS FOR LOCATIONS AND DETAILS.
- PAVEMENT-MARKING PAINT: ALKYD-RESIN TYPE, LEAD AND CHROMATE FREE, READY MIXED, COMPLYING WITH FS TT-P-115, TYPE 1 OR AASHTO M 249, TYPE N. SELECT FROM COLORS BELOW; DISTINGUISH LOCATIONS IF MORE THAN ONE COLOR IS REQUIRED.
- COLOR:
  - WHITE, (STANDARD PARKING SPACES AND TRAFFIC INDICATORS)
  - BLUE, (ALL HANDICAP ACCESSIBLE SYMBOLS AND SIGNAGE)
- DO NOT APPLY PAVEMENT-MARKING PAINT UNTIL LAYOUT, COLORS, AND PLACEMENT HAVE BEEN VERIFIED WITH THE DEPARTMENT. MARKING-PAINT MANUFACTURERS CAUTION THAT PAINT WILL BLEED OR TEAR SURFACE OF NEW ASPHALT UNLESS ASPHALT IS AGED BEFORE PAINTING. THIS AGING PERIOD MAY VARY FROM 30 TO 90 DAYS. IF PAVEMENT MARKING MUST PROCEED IMMEDIATELY, CONSIDER REVISITING TO A PHASED APPLICATION OF A THIN FIRST COAT FOLLOWED BY A THICKER SECOND COAT ONCE ASPHALT HAS AGED. VERIFY THAT TWO-COAT APPLICATION IS RECOMMENDED BY PAVEMENT-MARKING MANUFACTURER.
- ALLOW PAVING TO AGE FOR 15 DAYS BEFORE STARTING PAVEMENT MARKING, UNLESS OTHERWISE SPECIFIED BY THE MANUFACTURER.
- SWEEP AND CLEAN SURFACE TO ELIMINATE LOOSE MATERIAL AND DUST. APPLY PAINT WITH MECHANICAL EQUIPMENT TO PRODUCE PAVEMENT MARKINGS, OF DIMENSIONS INDICATED, WITH UNIFORM, STRAIGHT EDGES. APPLY AT MANUFACTURER'S RECOMMENDED RATES TO PROVIDE A MINIMUM WET FILM THICKNESS OF 15 MILS.
- CONTRACTOR WILL PROVIDE CATALOG DATA AS PART OF THE MATERIAL SUBMITTAL FOR PAVEMENT MARKING PRODUCTS

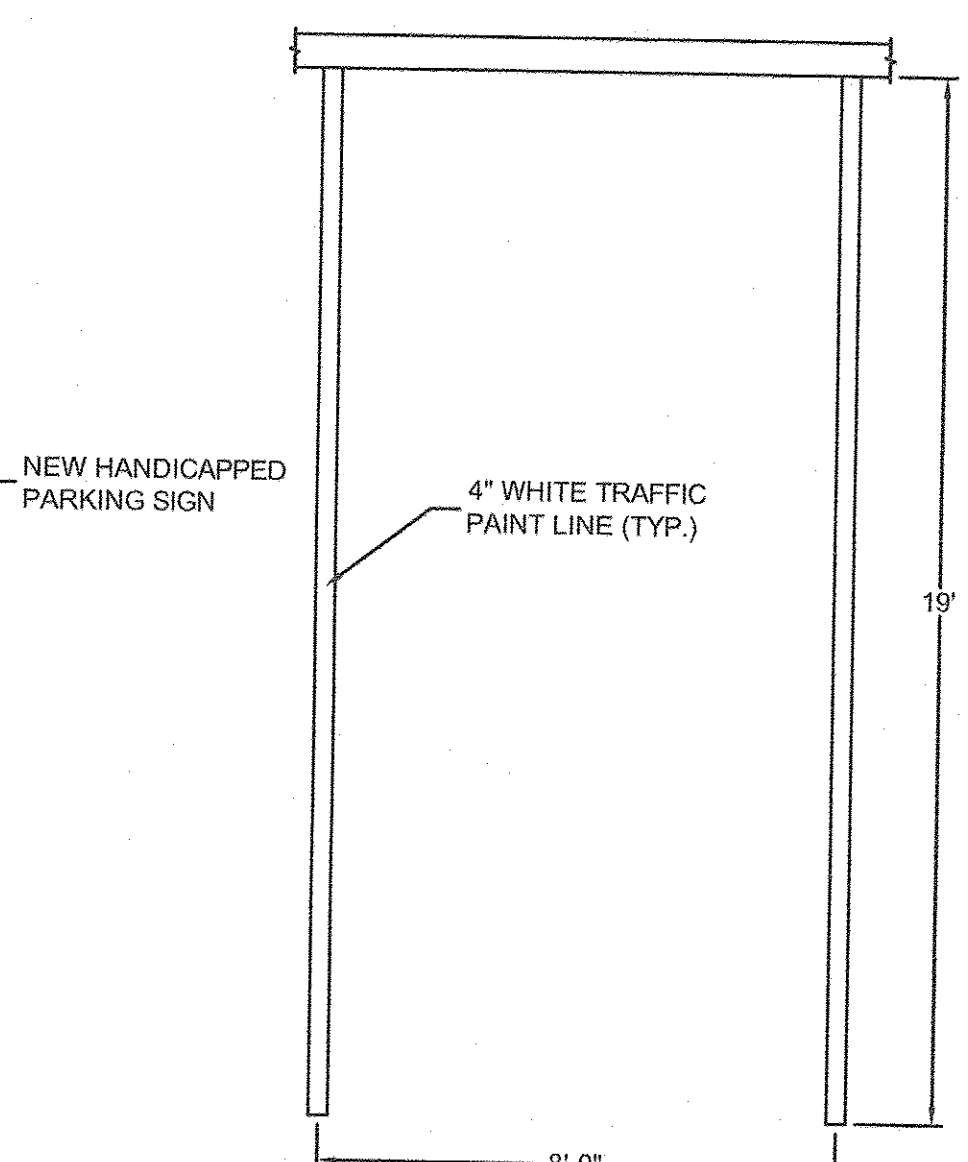
**SITE / CIVIL LEGEND**

EXISTING	PROPOSED	
450	[450]	CONTOUR LINE
SS	SS	SANITARY SEWER
W	W	WATER LINE
Eux	E	ELECTRIC - UNDERGROUND
E	E	ELECTRIC - OVERHEAD
---x---	---x---	FENCELINE
---o---	---o---	COMMUNICATION - UNDERGROUND
---g---	---g---	NATURAL GAS
---	---	STORM SEWER
---	---	EROSION FILTER SOCK
---	---	LIMIT OF DISTURBANCE
---	---	NATURAL GAS SHUTOFF VALVE W/ CURB STOP ENCLOSURE
---	---	WATER VALVE
MH-X SAN (EXG) RIM = XXX.XX' INV = XXX.XX' X 447.75	MH-X SAN (NEW) RIM = XXX.XX' INV = XXX.XX' X 447.75	MANHOLE
+	+	SPOT ELEVATION
+	+	BENCHMARK ELEVATION
→	→	FLOW ARROW
○	○	TEMPORARY ROCK FILTER
○	○	UTILITY POLE
○	○	FIRE HYDRANT
---	---	CONCRETE HATCH
---	---	TREE
---	---	EROSION CONTROL MATTE
---	---	POLE MOUNTED AREA LIGHTING
---	---	GROUND MOUNTED FLOODLIGHT
---	---	STORM INLET
---	---	RIP-RAP
---	---	DEMOLITION AREA
---	---	NEW BITUMINOUS AREA
---	---	COMPACTED GRAVEL AREA

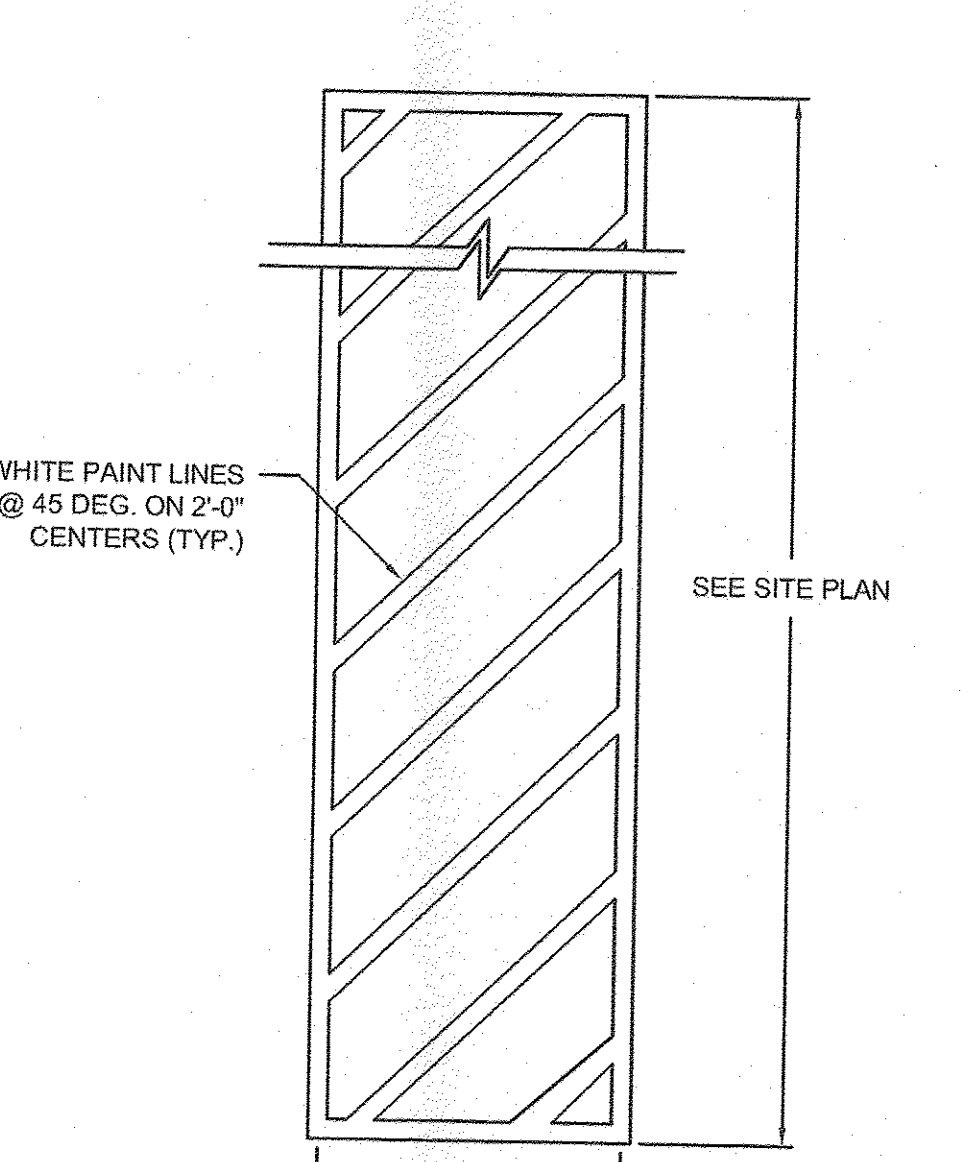
**NEW SITE PLAN**



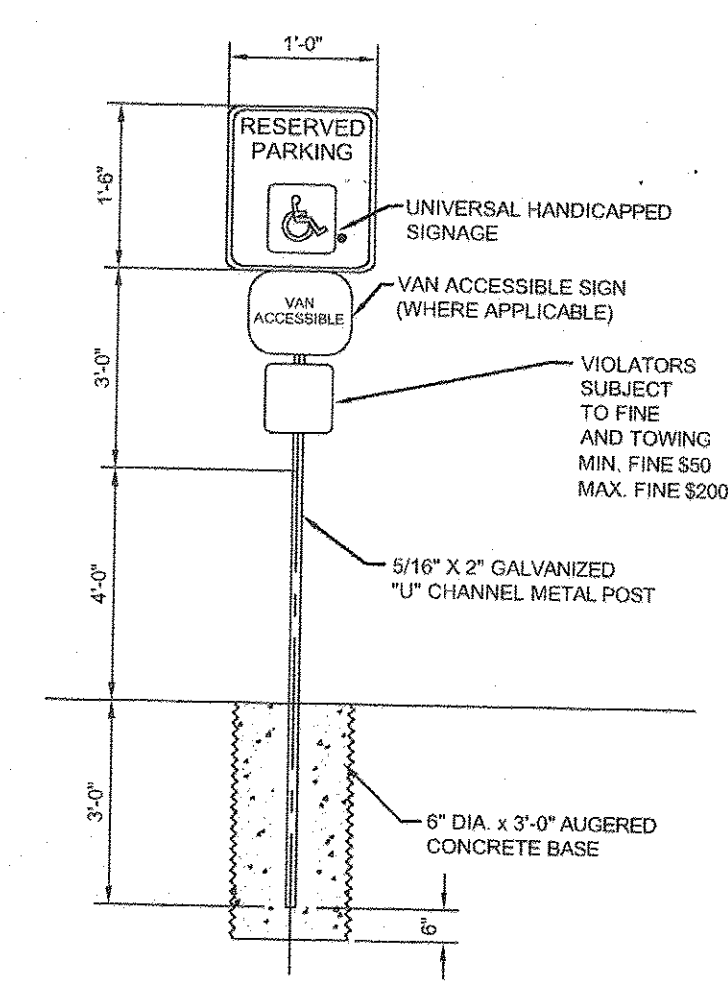
VAN ACCESSIBLE HANDICAPPED PARKING STALL DETAIL



PARKING STALL DETAIL



CROSS-WALK DETAIL



HANDICAPPED SIGN DETAIL

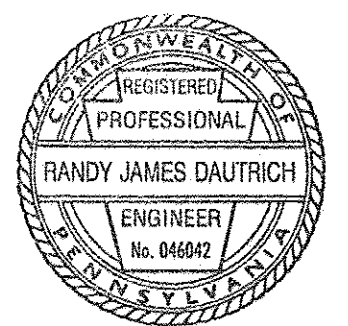
**VERIFY SCALE**

BAR IS ONE (1) INCH LONG ON ORIGINAL DRAWING.

IF BAR IS NOT ONE (1) INCH LONG, ADJUST SCALE ACCORDINGLY

CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS. VARIANCE FROM CONTRACT DOCUMENTS NOT PERMITTED WITHOUT BUREAU OF ENGINEERING AND ARCHITECTURE APPROVAL.

NO.	DESCRIPTION	DATE
REVISIONS		



*Randy Dautrich* 4/13/18  
Professional's Signature Date

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS  
BUREAU OF MILITARY CONSTRUCTION AND ENGINEERING  
BLDG. 0-10, FORT INDIANTOWN GAP  
ANNVILLE, LEBANON COUNTY, PENNSYLVANIA

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF GENERAL SERVICES  
HARRISBURG, PENNSYLVANIA

PROJECT NO. D.G.S. **A962-58 PH. 1**  
DMVA PROJECT NO. 42160105

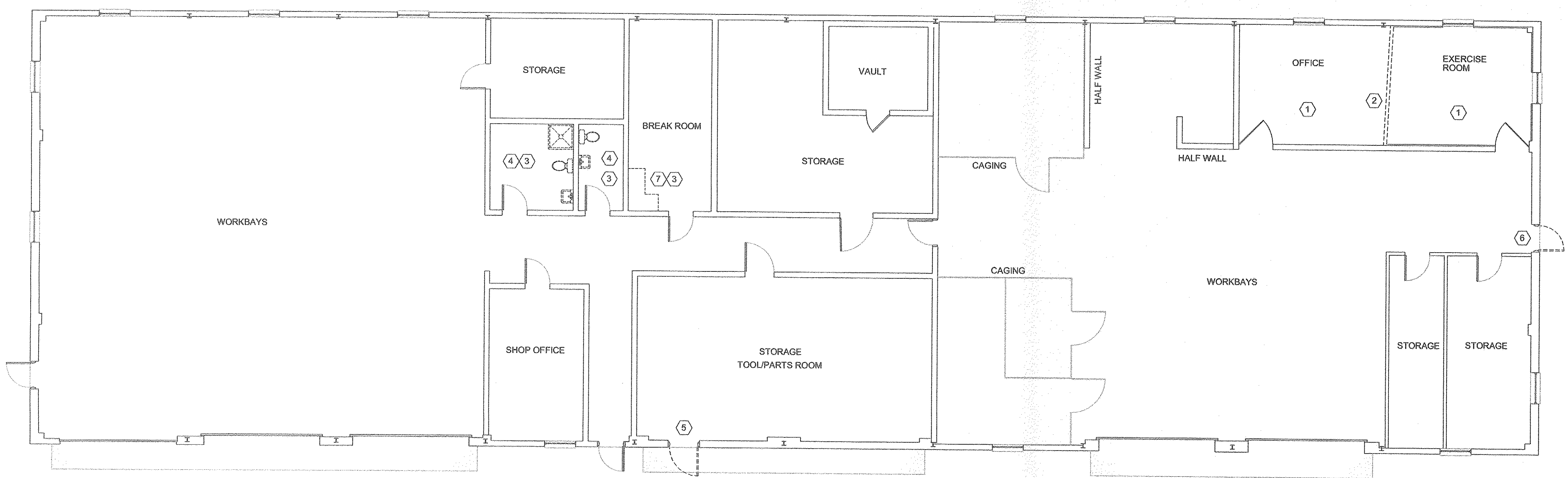
**HVAC & EXHAUST REPLACEMENT**

LOCK HAVEN FMS, 66 ARMORY RD., WOODWARD TWP.  
CLINTON CO., LOCK HAVEN, PENNSYLVANIA, 17745-0501

**NEW SITE PLAN**

DRAWN BY <b>K. LLOYD</b>	DATE <b>13 APRIL 2018</b>	DRAWING NO. <b>C.2.0</b>
CHECKED BY <b>R. DAUTRICH</b>	SCALE <b>AS NOTED</b>	

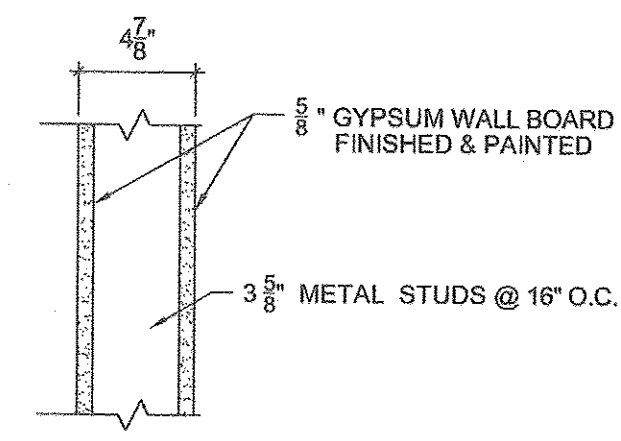
1 ADA ACCESSIBLE PARKING & EGRESS - TYP.  
C.2.0 NOT TO SCALE



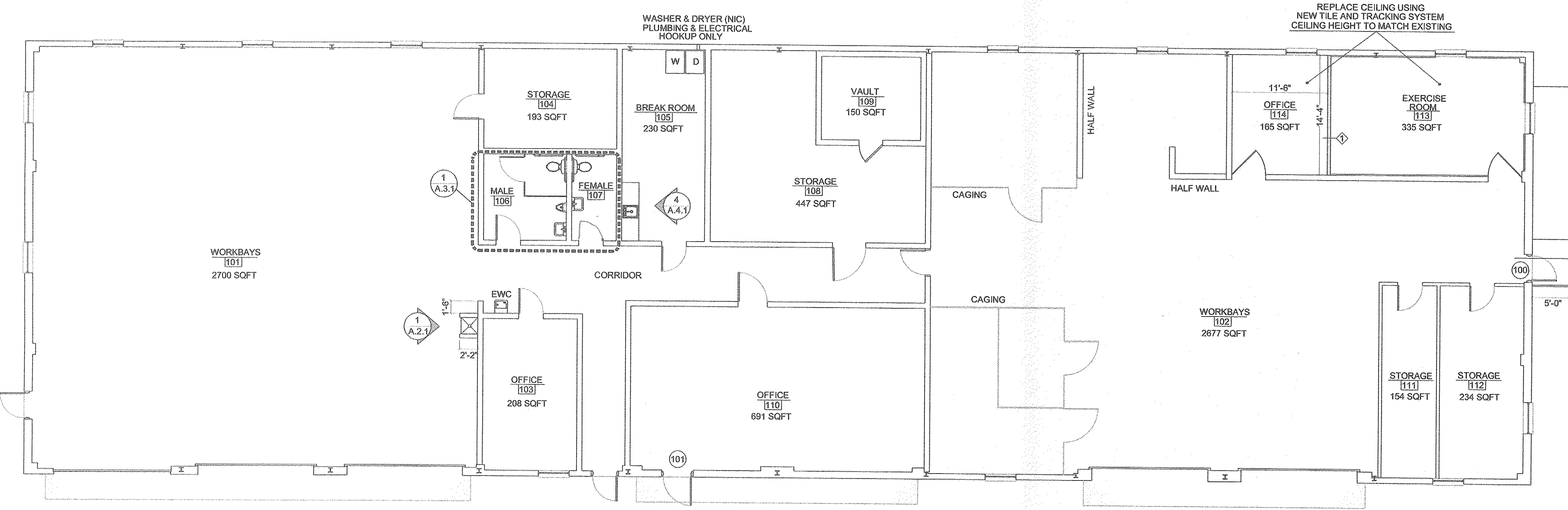
**DEMO PLAN**  
SCALE: 1/8" = 1'-0"

**DEMOLITION NOTES:**

1. REMOVE EXISTING CEILING.
2. REMOVE EXISTING WALL
3. REMOVE EXISTING VCT AND FLOOR BASE
4. REMOVE ALL PLUMBING FIXTURES
5. REMOVE EXTERIOR DOOR - RETURN ALL LOCK CORES TO DEPT.
6. REMOVE EXTERIOR DOOR AND FRAME - RETURN ALL LOCK CORES TO DEPT.
7. REMOVE EXISTING COUNTERTOP

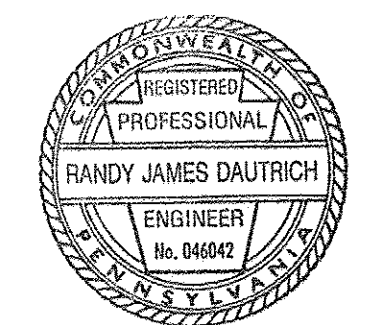


**WALL TYPE 1**



**FLOOR PLAN**  
SCALE: 1/8" = 1'-0"

NO.	DESCRIPTION	DATE
REVISIONS		



*Randy Dautrich* 4/13/18  
Professional's Signature Date

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS  
BUREAU OF MILITARY CONSTRUCTION AND ENGINEERING  
BLDG. 0-10, FORT INDIANTOWN GAP  
ANNVILLE, LEBANON COUNTY, PENNSYLVANIA

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF GENERAL SERVICES  
HARRISBURG, PENNSYLVANIA

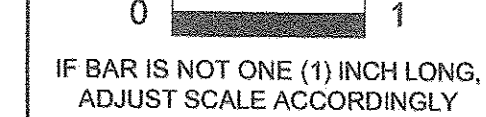
PROJECT NO. D.G.S. A962-58 PH. 1  
DMVA PROJECT NO. 42160105

**HVAC & EXHAUST REPLACEMENT**  
LOCK HAVEN FMS  
CLINTON COUNTY, LOCK HAVEN, PENNSYLVANIA

**FLOOR PLAN**

**VERIFY SCALE**

BAR IS ONE (1) INCH LONG ON ORIGINAL DRAWING.

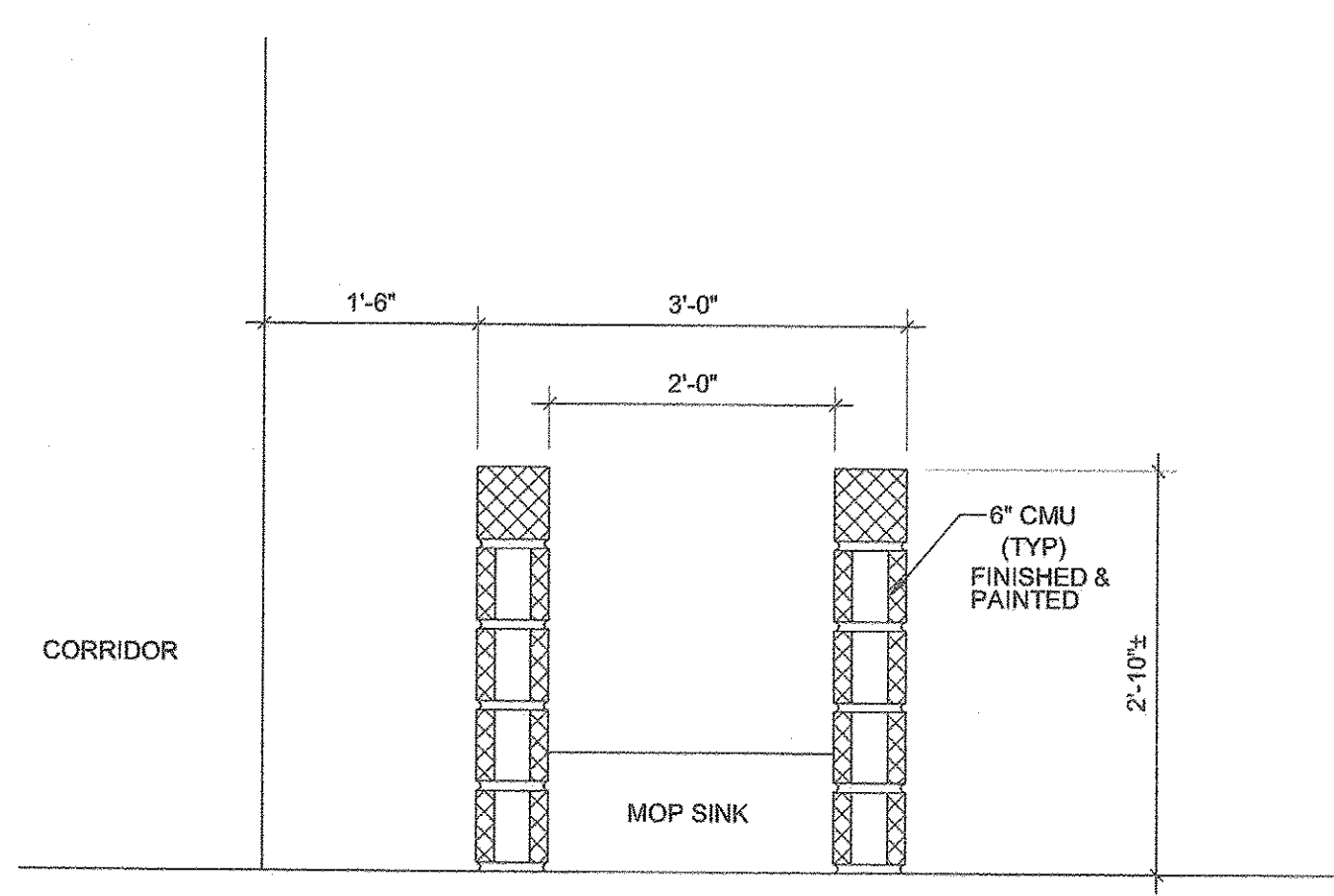
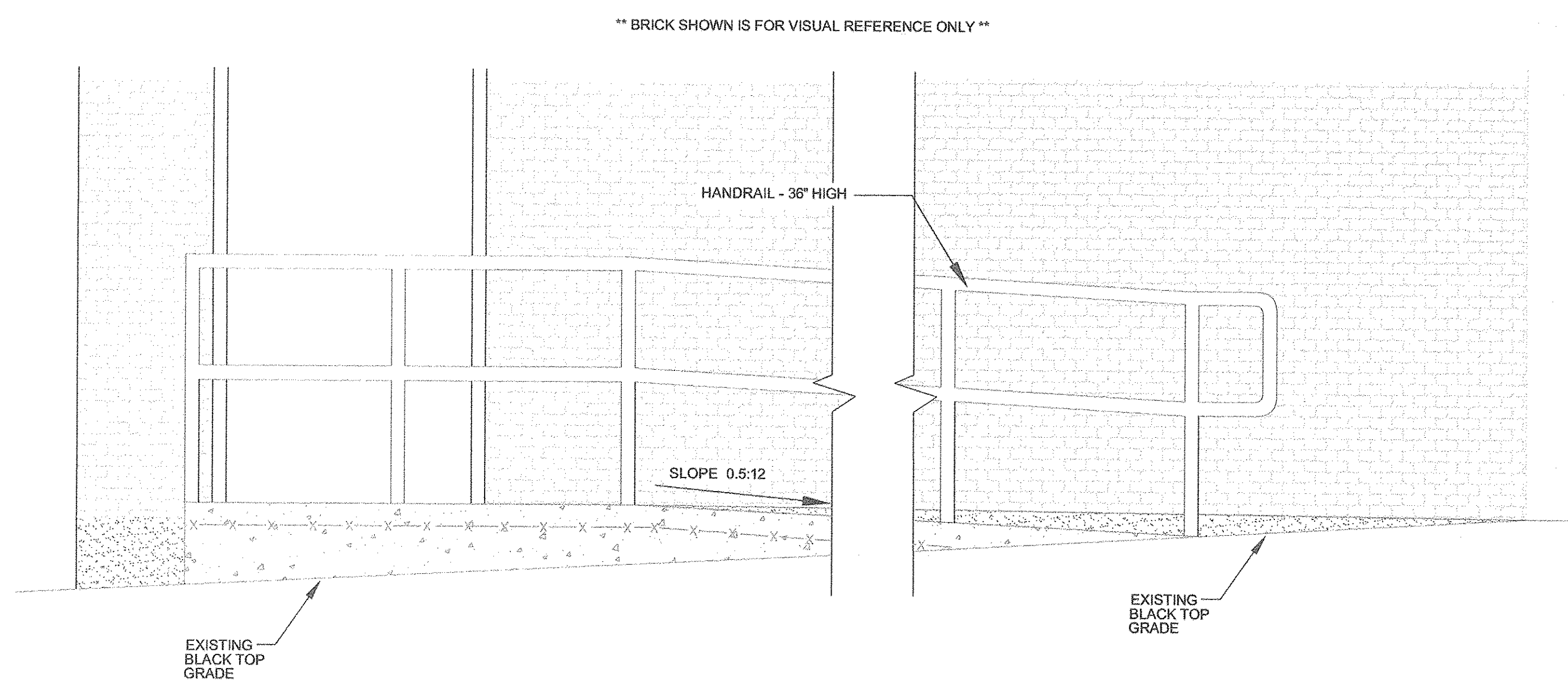
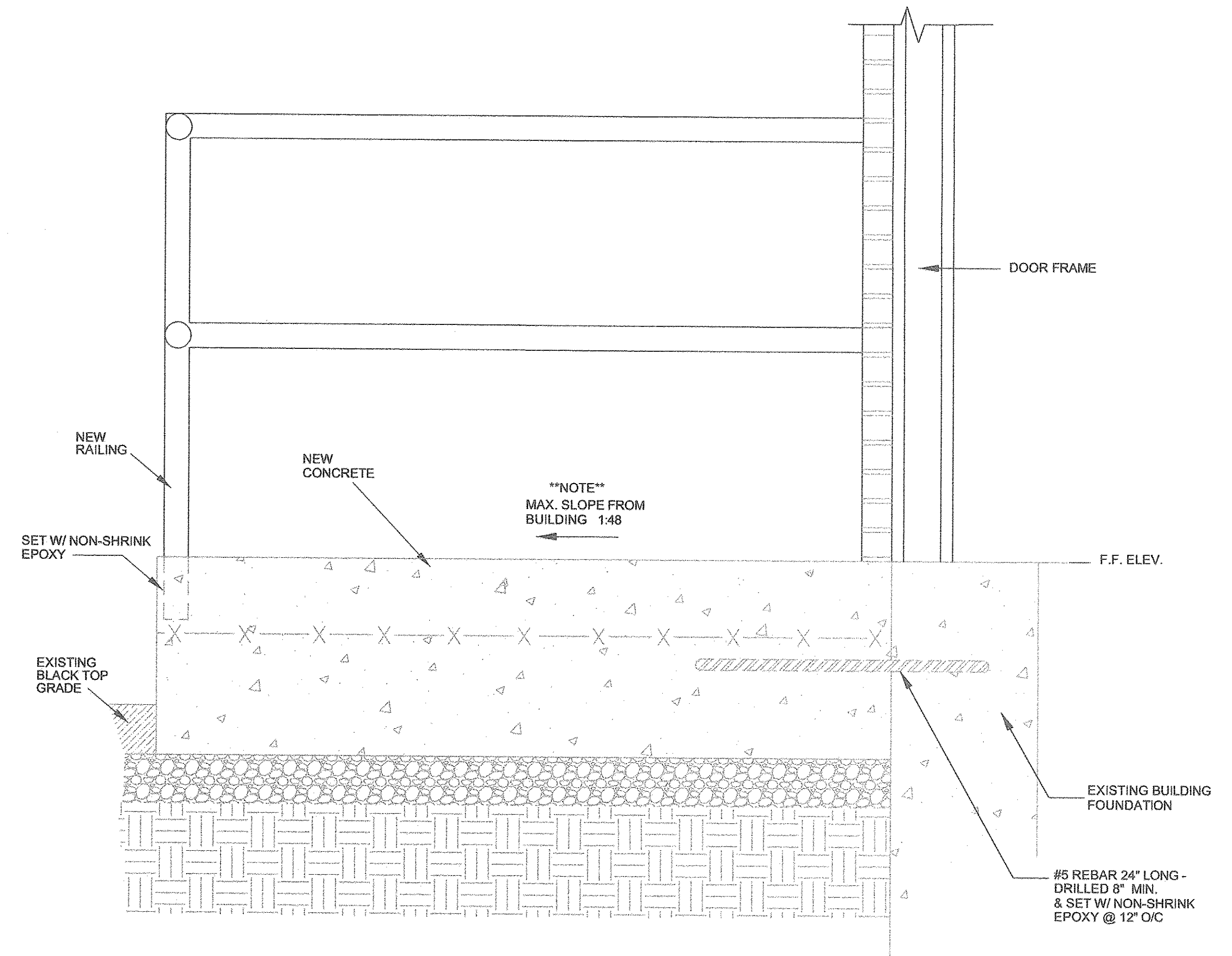
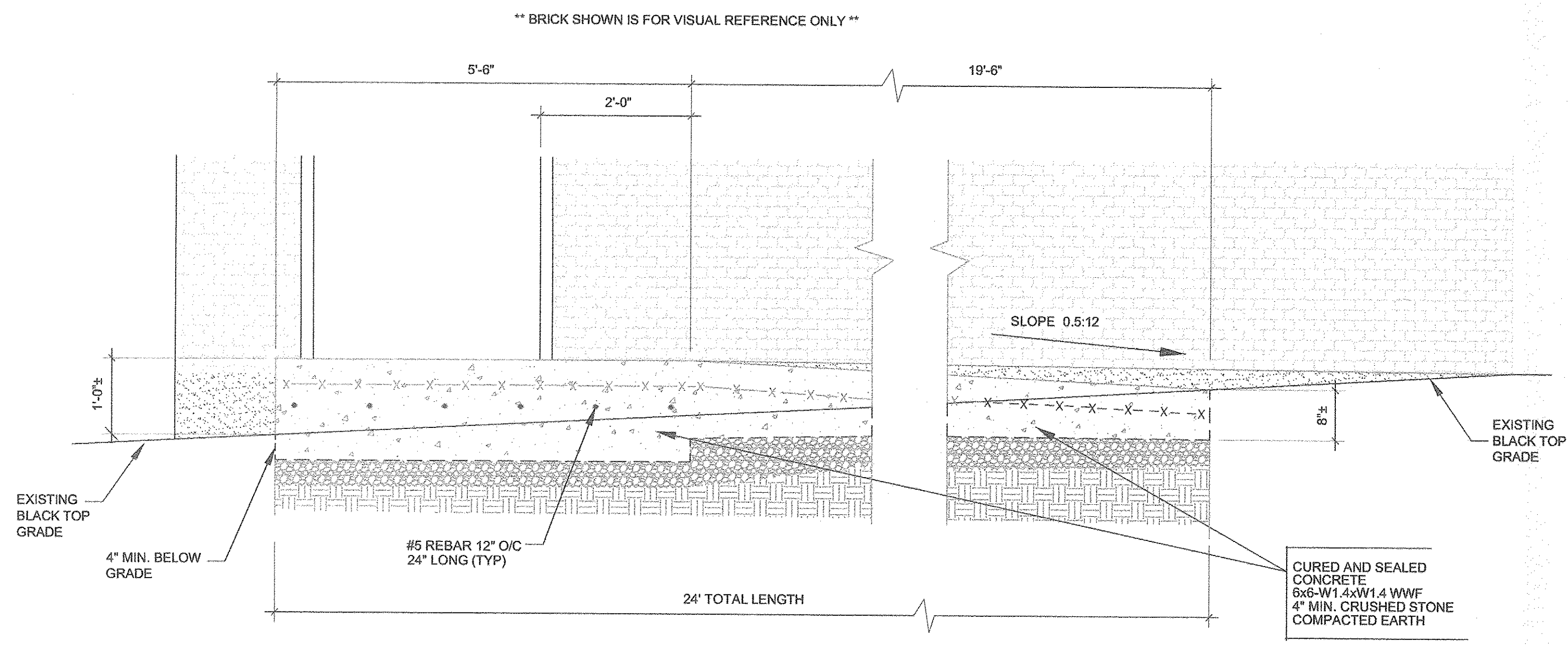


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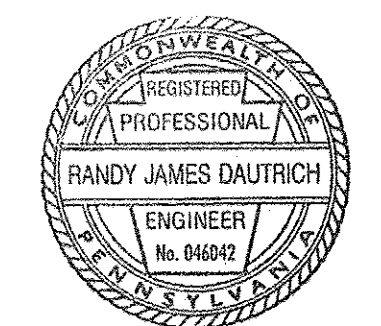
DRAWN BY R. FISHBURN	DATE 13-APRIL-2018	DRAWING NO. A.1.1
CHECKED BY R. DAUTRICH	SCALE AS NOTED	





**\*\*NOTE\*\***  
RAILING STRUCTURAL PERFORMANCE  
UNIFORM LOAD: 50 lbf / ft IN ANY DIRECTION  
CONCENTRATED LOAD: 200 lbf. IN ANY DIRECTION

NO.	DESCRIPTION	DATE
REVISIONS		



*Randy Dautrich* 4/13/18  
Professional's Signature Date

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS  
BUREAU OF MILITARY CONSTRUCTION AND ENGINEERING  
BLDG. 0-10, FORT INDIANTOWN GAP  
ANNVILLE, LEBANON COUNTY, PENNSYLVANIA

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF GENERAL SERVICES  
HARRISBURG, PENNSYLVANIA

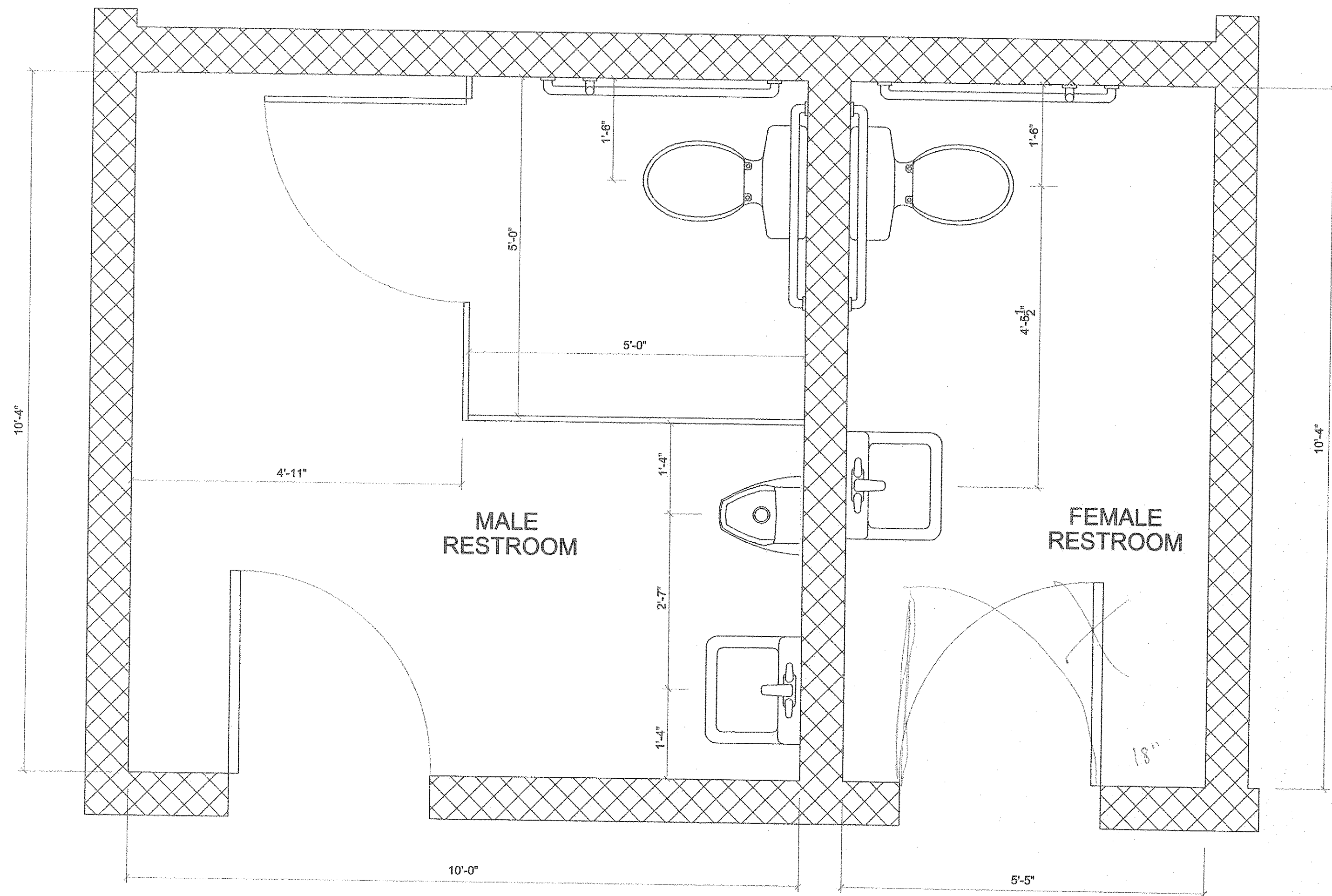
PROJECT NO. D.G.S. A962-58 PH. 1  
DMVA PROJECT NO. 42160105

**HVAC & EXHAUST  
REPLACEMENT**  
LOCK HAVEN FMS  
CLINTON COUNTY, LOCK HAVEN, PENNSYLVANIA

**ELEVATIONS & DETAILS**

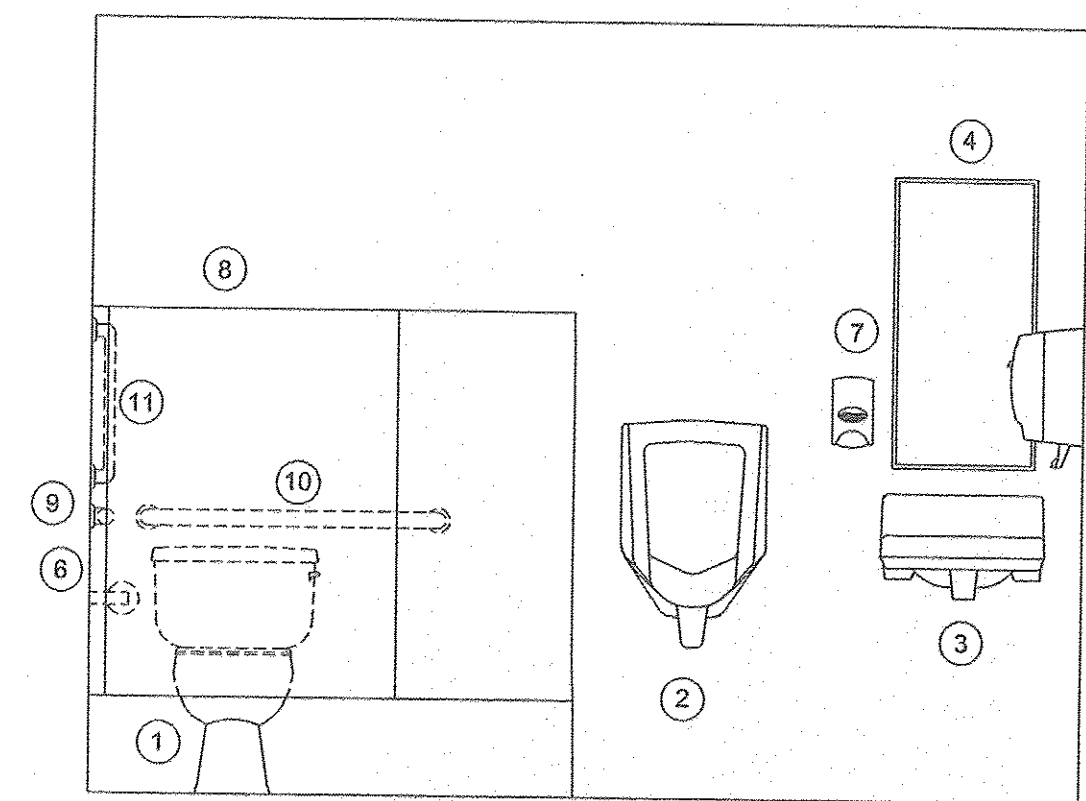
**VERIFY SCALE**  
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0 1  
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DRAWN BY R. FISHBURN	DATE 13-APRIL-2018	DRAWING NO. A.2.1
CHECKED BY R. DAUTRICH	SCALE AS NOTED	

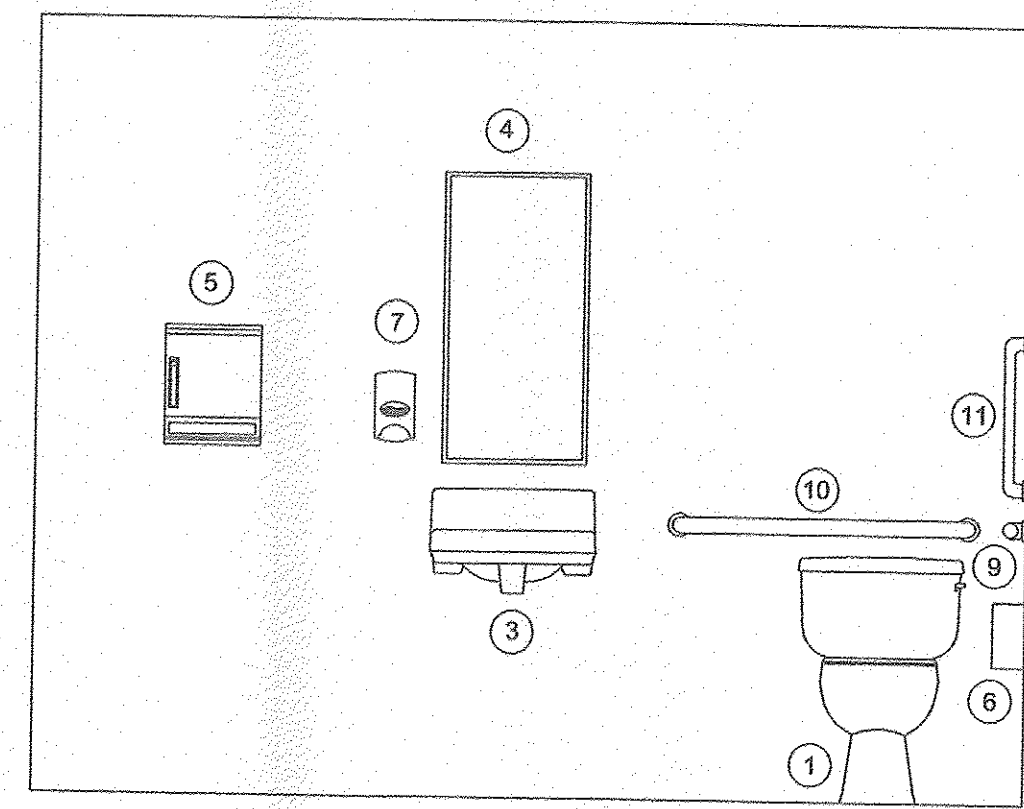


1 ENLARGED FLOOR PLAN  
A.1.1 SCALE: 3/4" = 1'-0"

REVERSE SWING OF DOOR  
(as shown on A.1.1 demo plan).



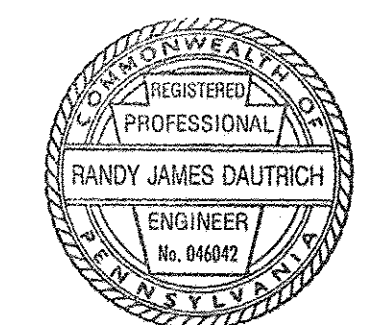
MALE LATRINE WALL ELEVATIONS  
SCALE: 1/2" = 1'-0"



FEMALE RESTROOM WALL ELEVATIONS  
SCALE: 1/2" = 1'-0"

TOILET ROOM ACCESSORIES					
NO.	DESCRIPTION	MOUNTING HEIGHT (AFF)		REMARKS	NO.
		STANDARD	ADA		
1	WATER CLOSET		17"	TOP OF BOWL	1
2	URINAL	24"		TOP OF SPUD	2
3	SINK		34"	COUNTER MOUNTED	3
4	MIRROR		40"	BOTTOM OF FRAME	4
5	PAPER TOWEL DISPENSER		44"	BOTTOM OF DISPENSER	5
6	TOILET PAPER DISPENSER		19"	BOTTOM OF DISPENSER	6
7	SOAP DISPENSER		40"	BOTTOM OF DISPENSER	7
8	TOILET PARTITION			FLOOR MOUNTED W/ OH RAILS	8
9	42" GRAB BAR		34"	CENTER OF BAR	9
10	36" GRAB BAR		34"	CENTER OF BAR	10
11	18" VERTICAL GRAB BAR		39"	CENTER OF BOTTOM BRACKET	11

NO.	DESCRIPTION	DATE
REVISIONS		



*Randy Dautrich* 4/13/18  
Professional's Signature Date

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS  
BUREAU OF MILITARY CONSTRUCTION AND ENGINEERING  
BLDG. 0-10, FORT INDIANTOWN GAP  
ANNVILLE, LEBANON COUNTY, PENNSYLVANIA

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF GENERAL SERVICES  
HARRISBURG, PENNSYLVANIA

PROJECT NO. D.G.S. A962-58 PH. 1  
DMVA PROJECT NO. 42160105

**HVAC & EXHAUST REPLACEMENT**  
LOCK HAVEN FMS  
CLINTON COUNTY, LOCK HAVEN, PENNSYLVANIA

**RESTROOMS**

**VERIFY SCALE**  
BAR IS ONE (1) INCH LONG ON ORIGINAL DRAWING.  
0 1  
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DRAWN BY R. FISHBURN	DATE 13-APRIL-2018	DRAWING NO. A.3.1
CHECKED BY R. DAUTRICH	SCALE AS NOTED	

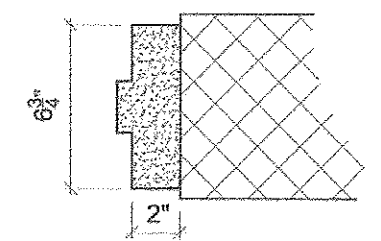


## ROOM FINISH SCHEDULE

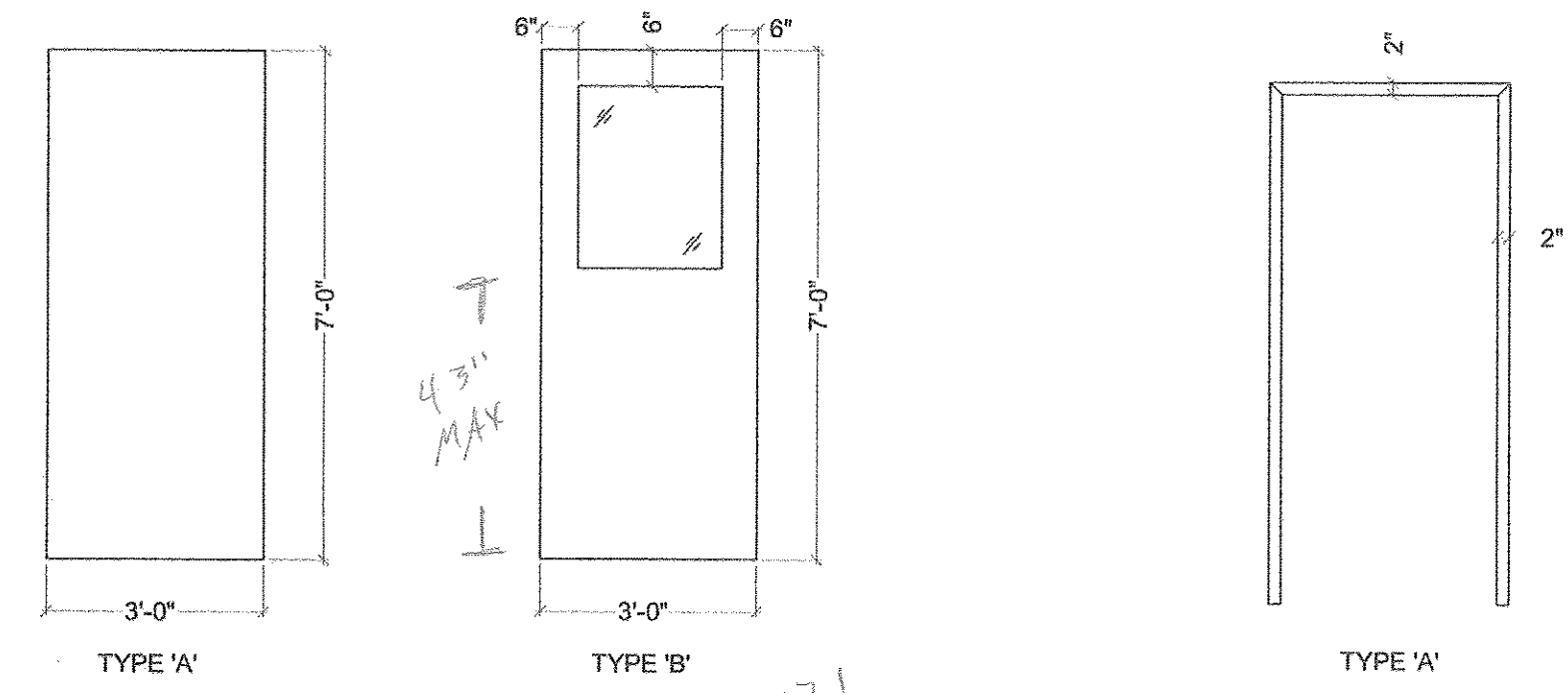
RM. NO.	ROOM NAME	FLOOR MATERIAL	BASE MATERIAL	WALLS				CEILING		REMARKS	RM. NO.
				MATERIAL 'A'	MATERIAL 'B'	MATERIAL 'C'	MATERIAL 'D'	MATERIAL	HGT.		
101	WORKBAY 1	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING		101
102	WORKBAY 2	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING		102
103	OFFICE	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING		103
104	STORAGE	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING		104
105	BREAKROOM	VCT	4" VCB	PAINT, CMU	PAINT, CMU	PAINT, CMU	PAINT, CMU	PAINT	EXISTING		105
106	MALE RESTROOM	VCT	4" VCB	PAINT, CMU	PAINT, CMU	PAINT, CMU	PAINT, CMU	PAINT	EXISTING	IBC 1210.2	106
107	FEMALE RESTROOM	VCT	4" VCB	PAINT, CMU	PAINT, CMU	PAINT, CMU	PAINT, CMU	PAINT	EXISTING	IBC 1210.2	107
108	STORAGE	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING		108
109	VAULT	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING		109
110	OFFICE	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING		110
111	STORAGE	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING		111
112	STORAGE	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING		112
113	EXERCISE ROOM	EPOXY	4" VCB	EXISTING, PAINT, CMU	EXISTING	EXISTING, PAINT, CMU	PAINT GYP. BOARD	ACT	EXISTING		113
114	OFFICE	EPOXY	4" VCB	PAINT, CMU	PAINT GYP. BOARD	PAINT, CMU	PAINT, CMU	ACT	EXISTING		114

## DOOR HARDWARE SCHEDULE

**SET 1**  
 HINGES: HEAVY DUTY, 5 KNUCKLE, FULL MORTISE  
 OPENING DEVICE: LEVER W/ KEYED CORE  
 LOCKING DEVICE: MORTISE LOCK  
 EXIT: TOUCH BAR  
 CLOSER: TOP SURFACE MOUNTED ON DOOR W/ 120° PARALLEL ARM  
 THRESHOLD: A.D.A. COMPLIANT



TYPE 'A'  
**JAMB TYPES**  
 SCALE: 1-1/2" = 1'-0"

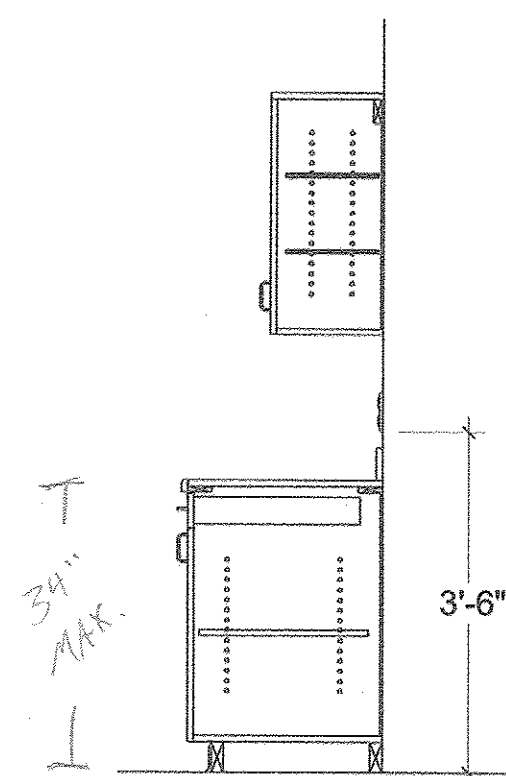
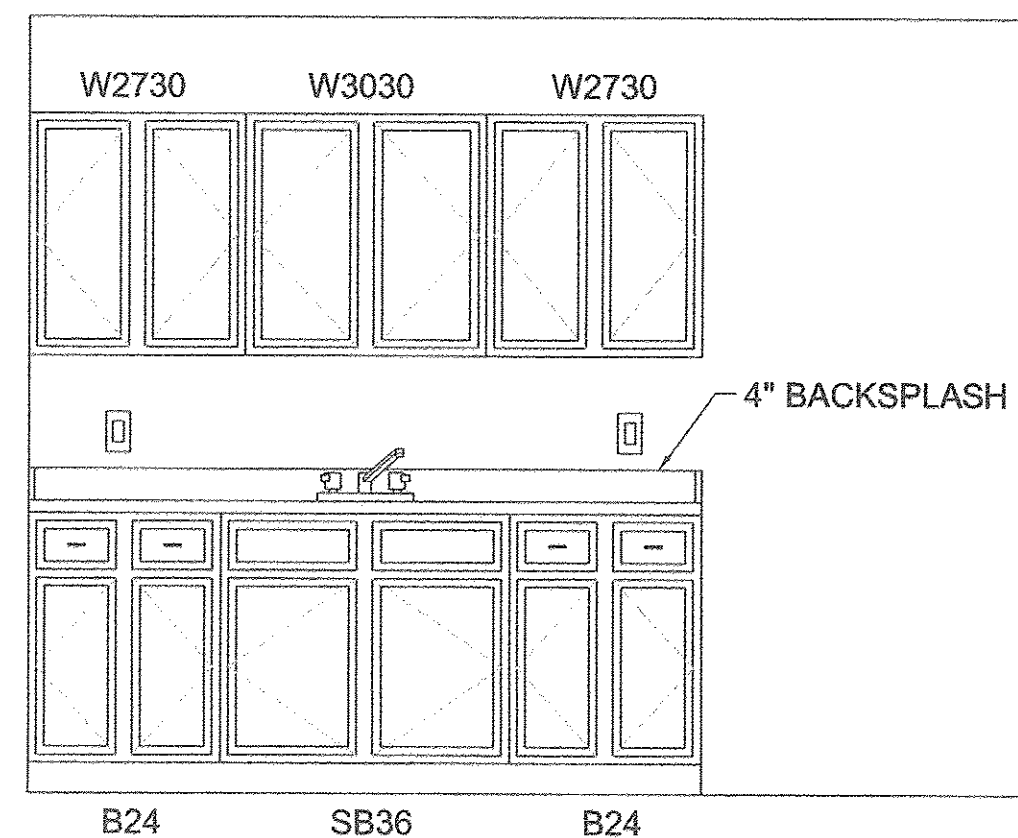


DOOR TYPES  
 SCALE: 3/8" = 1'-0"

FRAME TYPES  
 SCALE: 3/8" = 1'-0"

## DOOR AND FRAME SCHEDULE

DOOR NUMBER	SIZE			DOOR				LOUVER			FIRE RATING		FRAME		JAMB TYPE		SET NO.		HARDWARE		REMARKS	DOOR NUMBER
	W	H	T	MAT'L	TYPE	GLASS	W	H			MAT'L	TYPE					KEY SIDE	CLOSER SIDE				
100	3'-0"	7'-0"	2"	STEEL	A								STEEL	A	A	1	EXTERIOR	INTERIOR				100
101	3'-0"	7'-0"	2"	STEEL	B	24" X 30"							EXISTING	EXISTING	EXISTING	1	EXTERIOR	INTERIOR				101

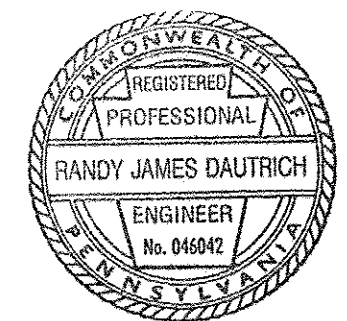


SECTION VIEW

NOTE:  
 1. CONTRACTOR TO FIELD VERIFY ALL DIMENSIONS PRIOR TO ORDERING CABINETRY. DIMENSIONS TO BE ADJUSTED AS NEEDED TO ACCOMMODATE FIELD CONDITIONS.

4 **BREAKROOM CABINET ELEV.**  
 SCALE: 1/2" = 1'-0"

NO.	DESCRIPTION	DATE
REVISIONS		



*Randy Dautrich 4/13/18*  
 Professional's Signature Date

COMMONWEALTH OF PENNSYLVANIA  
 DEPARTMENT OF MILITARY AND VETERANS AFFAIRS  
 BUREAU OF MILITARY CONSTRUCTION AND ENGINEERING  
 BLDG. 0-10, FORT INDIANTOWN GAP  
 ANNVILLE, LEBANON COUNTY, PENNSYLVANIA

COMMONWEALTH OF PENNSYLVANIA  
 DEPARTMENT OF GENERAL SERVICES  
 HARRISBURG, PENNSYLVANIA

PROJECT NO. D.G.S. A962-58 PH.1  
 DMVA PROJECT NO. 42160105

## HVAC & EXHAUST REPLACEMENT

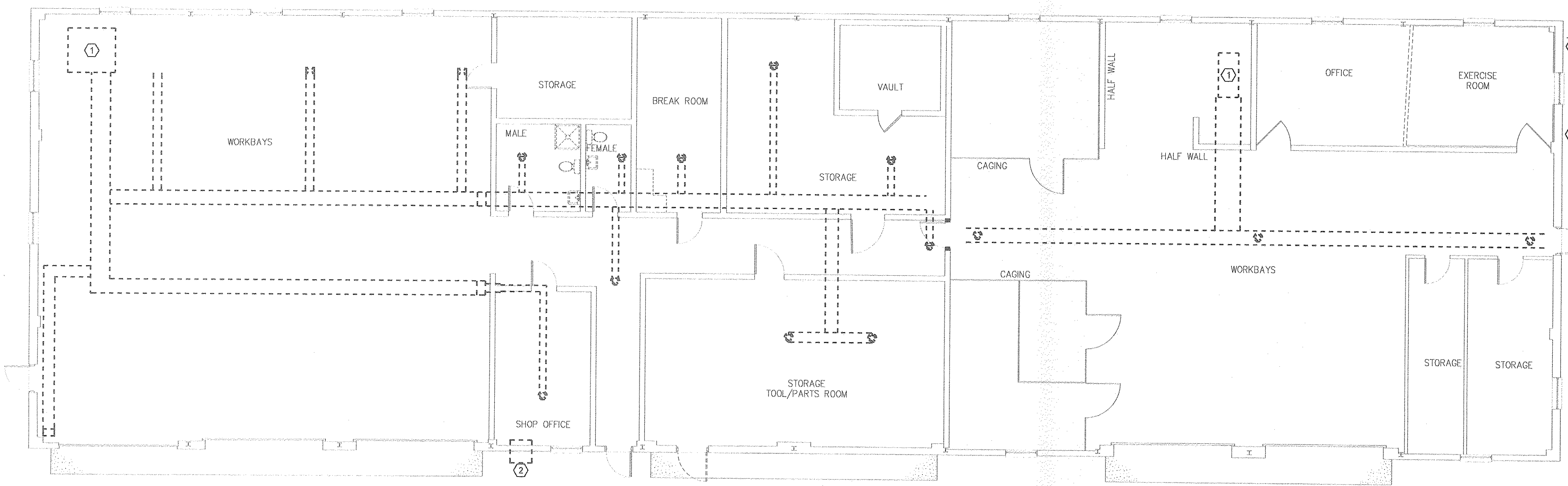
LOCK HAVEN FMS  
 CLINTON COUNTY, LOCK HAVEN, PENNSYLVANIA

## DOORS & DETAILS

**VERIFY SCALE**  
 BAR IS ONE (1) INCH LONG ON ORIGINAL DRAWING:  
 0 1  
 IF BAR IS NOT ONE (1) INCH LONG, ADJUST SCALE ACCORDINGLY  
 CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS.  
 VARIANCE FROM CONTRACT DOCUMENTS NOT PERMITTED WITHOUT BUREAU OF ENGINEERING AND ARCHITECTURE APPROVAL.

DRAWN BY R. FISHBURN	DATE 13-APRIL-2018	DRAWING NO. <b>A.4.1</b>
CHECKED BY R. DAUTRICH	SCALE AS NOTED	





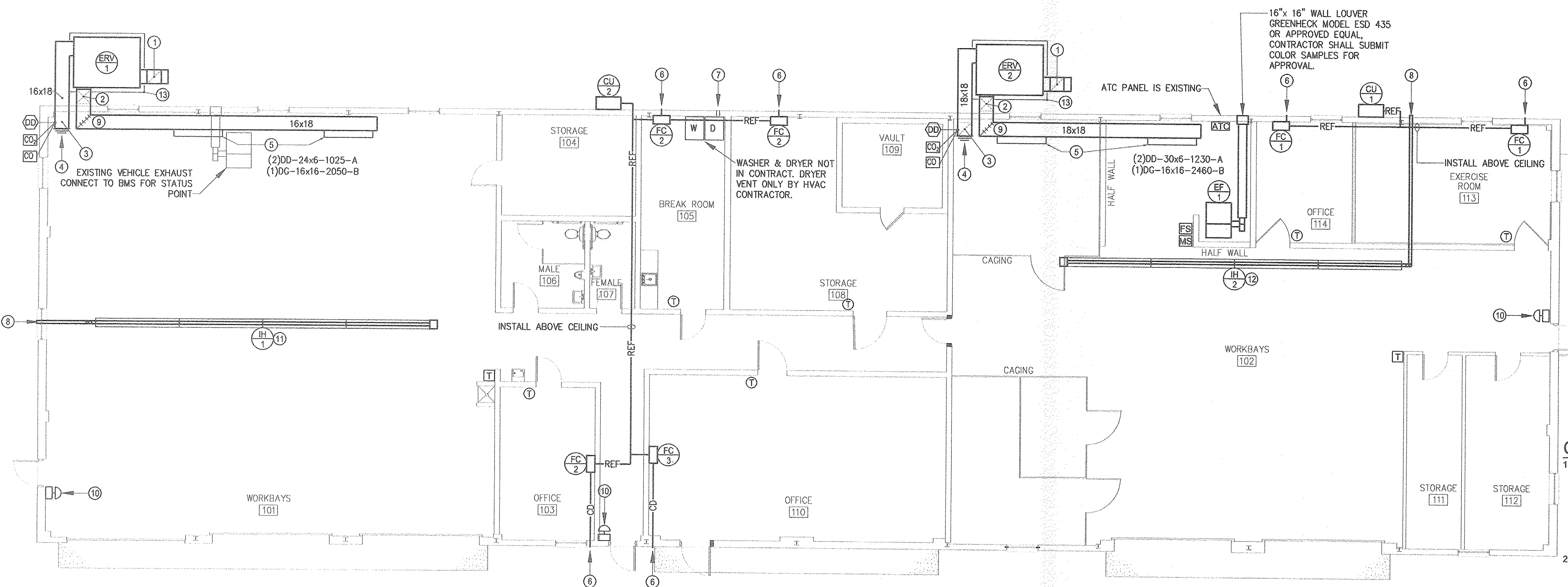
**DEMOLITION NOTES**

- ① DISCONNECT, REMOVE & DISPOSE OF OIL FIRED FURNACE AND ALL ASSOCIATED DUCTWORK, DIFFUSERS, GRILLES AND INTERIOR HEATING OIL PIPING. PATCH EXTERIOR PENETRATIONS WEATHER TIGHT AND TO MATCH EXISTING. PATCH CEILINGS TO MATCH EXISTING. DIFFUSER/GRILLE CEILING TILES SHALL BE REPLACED WITH BLANK CEILING TILES TO MATCH EXISTING.
- ② DISCONNECT, REMOVE & DISPOSE OF PTAC UNIT. PATCH WALL TO MATCH EXISTING. SHALL BE WEATHER TIGHT.

**GENERAL NOTES**

- 1. HVAC & PLUMBING CONTRACTORS SHALL COORDINATE THE DEMO OF THE HEATING OIL SYSTEM.
- 2. HVAC CONTRACTOR SHALL PROVIDE TEMPORARY HEAT AS NEEDED DURING CONSTRUCTION TO MAINTAIN 65°F WHEN 0°F OUTSIDE.

**HVAC FLOOR PLAN - DEMO**  
SCALE: 1/8" = 1'-0"



**DRAWING NOTES**

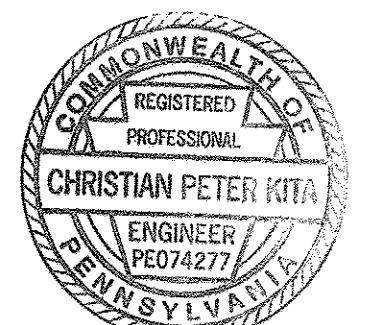
- ① OUTSIDE AIR INTAKE WITH GOOSENECK DUCT UP SHALL BE AT LEAST 10 FEET ABOVE GRADE TO SATISFY ANTI-TERRORISM FORCE PROTECTION STANDARDS.
- ② DUCT UP TO SATISFY NOTE 9.
- ③ DUCT DOWN TO ENABLE LOCATION OF RETURN GRILLE BOTTOM EDGE TO BE 18" ABOVE FINISH FLOOR.
- ④ DUCT RETURN GRILLE, BOTTOM EDGE 18" ABOVE FINISH FLOOR.
- ⑤ DUCT DIFFUSER DIRECTED TOWARD PEAK OF CEILING.
- ⑥ TERMINATE CONDENSATE DRAIN PIPE AT EXTERIOR WITH 45° DOWNTURN ELBOW 24" ABOVE GRADE.
- ⑦ PROVIDE AND INSTALL 4" DRYER VENT DUCT WORK THRU WALL, INCLUDE DRYER VENT HOOD ON EXTERIOR AND 4" DUCT CAP ON INTERIOR.
- ⑧ 4" TYPE "B" VENT UP THRU WALL. TERMINATE BEYOND WALL WITH APPROVED VENT CAP PER MANUFACTURERS RECOMMENDATIONS.
- ⑨ INSTALL DUCT ALONG WALL SUCH THAT TOP OF DUCT IS NO HIGHER THAN THE BOTTOM EDGE OF CEILING JOISTS.
- ⑩ PROVIDE & INSTALL HVAC SHUTDOWN (MUSHROOM) SWITCH AT BUILDING PERSONNEL EXIT DOORS, 48" ABOVE FINISH FLOOR WITH HINGED CLEAR COVER & IDENTIFICATION SIGNAGE.
- ⑪ INSTALL AT PEAK OF CEILING THROUGH THE JOIST STRUCTURE. COORDINATE LOCATION TO AVOID CONFLICTS WITH LIGHTS AND EXISTING CEILING FANS.
- ⑫ INSTALL AT CEILING AS FAR AWAY FROM ROLL UP DOORS AS POSSIBLE. COORDINATE LOCATION TO AVOID CONFLICTS WITH LIGHTS AND EXISTING CEILING FANS.
- ⑬ HVAC CONTRACTOR SHALL INSTALL CONCRETE MAINTENANCE PAD FOR ERV, SHALL BE 6 INCHES THICK WITH REINFORCING WIRE MESH AND 6 INCHES LONGER THAN THE FOOTPRINT OF THE ERV UNIT ON ALL FOUR SIDES.

**GENERAL NOTES**

- 1. LEAD PAINT: WORK SHALL BE CONDUCTED UNDER THE ASSUMPTION THAT ALL SURFACE COATINGS CONTAIN LEAD. ALL DISTURBANCE ACTIVITIES SHALL COMPLY WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL REGULATIONS INCLUDING OSHA 29 CFR 1926.62. WORK ACTIVITIES SHALL ENSURE AREAS BEYOND WORK AREA ARE NOT CONTAMINATED. REFER TO SECTION 01040 OR TOC FOR ANY ADDITIONAL REQUIREMENTS.
- 2. HVAC CONTRACTOR SHALL PROVIDE AND INSTALL 2 PSI INLET REGULATORS FOR HVAC EQUIPMENT AND SHALL COORDINATE THIS WORK WITH PLUMBING CONTRACTOR. SEE PLUMBING DRAWINGS FOR LOCATIONS AND DETAILS.
- 3. HVAC CONTRACTOR SHALL PROVIDE AND INSTALL DUCT DETECTOR, CARBON DIOXIDE DETECTOR AND CARBON DIOXIDE DETECTOR FOR EACH ERV AND CONNECT ALL DETECTORS TO NEW BUILDING CONTROL SYSTEM, PROVIDED AND INSTALLED BY HVAC CONTRACTOR.

**HVAC FLOOR PLAN - NEW**  
SCALE: 1/8" = 1'-0"

NO.	DESCRIPTION	DATE
REVISIONS		



*Christian Peter Kita* 4/13/18  
Professional's Signature Date

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS  
BUREAU OF MILITARY CONSTRUCTION AND ENGINEERING  
BLDG. 0-10, FORT INDIANTOWN GAP  
ANNVILLE, LEBANON COUNTY, PENNSYLVANIA

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF GENERAL SERVICES  
HARRISBURG, PENNSYLVANIA

PROJECT NO. D.G.S. A962-58 PH.1  
DMVA PROJECT NO. 42160105

**HVAC & EXHAUST REPLACEMENT**  
LOCK HAVEN FMS  
CLINTON COUNTY, LOCK HAVEN, PENNSYLVANIA

**HVAC PLANS**

DRAWN BY M.R.A.	DATE 13-APRIL-2018	DRAWING NO. H.1.1
CHECKED BY C. KITA	SCALE AS NOTED	



NOTE: BUILDING POWER IS 240V SINGLE PHASE, THERE IS NO THREE PHASE AVAILABLE.

EF EXHAUST FAN SCHEDULE														
SYMBOL	LOCATION		BASIS OF DESIGN				ELECTRICAL CHARACTERISTICS							REMARKS
			MFG.	MODEL NO.	TYPE	C.F.M.	E.S.P.	R.P.M.	FAN MOTOR			VOLTAGE		
									WATTS/HP	AMPS	M.O.P.			
EF-1	102		VENTAIRE	TPD14R	DDPB	1400	5"W.G.	-	5HP	22	40	240V-1ø		①②

REMARKS  
 ① FURNISH AND INSTALL WITH HOODED WALL CAP, MOTOR OPERATED HOSE REEL AND APPROPRIATE CONTROLS. CONTROL OF REEL AND ON/OFF CONTROL OF FAN SHALL BE WITH PUSH BUTTON OR TOGGLE SWITCH PROVIDED BY FAN MANUFACTURER. INSTALL EXHAUST FAN AND HOSE REEL USING MANUFACTURER SUPPLIED RECOMMENDED BRACKETS SUCH THAT THE LOWEST POINT OF THE ENTIRE ASSEMBLY, INCLUDING ANY BRACKET/HARDWARE, SHALL BE A MINIMUM OF 8' ABOVE FINISHED FLOOR.  
 ② CONNECT TO BMS FOR STATUS POINT.

TYPE  
 DDPB = DIRECT DRIVE PRESSURE BLOWER

ERV ENERGY RECOVERY VENTILATOR SCHEDULE																											
SYMBOL	BASIS OF DESIGN		SERVING	O.A./E.A.	C.F.M.	ENERGY RECOVERY WHEEL					HEATING - LP				COOLING - DX SCROLL				ELECTRICAL DATA			REMARKS					
						E.S.P.	EXCH EFF.	FAN H.P.	SUMMER L.A.T. D.B.W.B. (°F)	WINTER L.A.T. D.B.W.B. (°F)	E.A.T. (°F)	L.A.T. (°F)	INPUT (MBH)	OUTPUT (MBH)	E.A.T. (°F) D.B.W.B.	L.A.T. (°F) D.B.W.B.	TOTAL (MBH)	SENS. (MBH)	M.C.A.	M.O.P.	VOLTAGE		WEIGHT (LBS.)				
ERV-1	GREENHECK	ERCH-20-30L-IG-01	101	O.A.	2042	1.0	75.6	3	79.0/66.4	55.2/45.7	55.5	91.5	100	80	N/A	N/A	N/A	N/A	39.7	50	230V-1ø	1411	①	②	③	④	⑤
			101	E.A.	2042	1.0	75.6	3	88.0/72.9	16.8/16.8																	
ERV-2	GREENHECK	ERCH-45-15L-IG-01	102	O.A.	2458	1.0	79.5	2	78.0/65.7	59.7/48.2	59.9	89.9	100	80	N/A	N/A	N/A	N/A	28.4	40	230V-1ø	1777	①	②	③	④	⑤
			102	E.A.	2458	1.0	79.5	2	89.0/73.4	12.3/12.3																	

REMARKS  
 ① HVAC CONTRACTOR SHALL PROVIDE SMOKE DETECTOR, CARBON MONOXIDE DETECTOR AND CARBON DIOXIDE DETECTOR AND INSTALL ON THE RETURN DUCT. ALL DETECTORS SHALL BE CONNECTED TO BUILDING MANAGEMENT SYSTEM. ALL DETECTORS SHALL HAVE ON BOARD ALARM INDICATOR LIGHT/AUDIBLE SIGNAL AND ON BOARD TEST AND RESET BUTTONS.  
 ② HVAC CONTRACTOR IS RESPONSIBLE FOR INSTALLING CONCRETE MAINTENANCE PAD FOR ERV. CONCRETE SHALL BE 6 INCHES THICK WITH REINFORCING WIRE MESH AND 6 INCHES LONGER THAN THE FOOTPRINT OF THE ERV UNIT ON ALL FOUR SIDES.  
 ③ UNIT SHALL BE PROVIDED WITH HAIL GUARDS, MODULATING FROST CONTROL, MERV8 FILTERS ON OUTDOOR AND EXHAUST AIR, MOTORIZED LOW LEAKAGE DAMPERS ON OUTDOOR AND RETURN AIR, UNOCCUPIED RECIRCULATION DAMPER, INTERNALLY MOUNTED CONTROL CENTER WITH MOTOR STARTERS, CONTROLS TRANSFORMER, ELECTRICAL DISCONNECT SWITCH & INTEGRAL 120V CONVENIENCE OUTLET THAT REMAINS ENERGIZED WHILE POWER TO THE UNIT IS SHUT OFF (COORDINATE WITH ELECTRICAL CONTRACTOR).  
 ④ UNIT SHALL HAVE BACNET INTERFACE FOR CONNECTION TO AUTOMATED LOGIC CONTROL SYSTEM. UNIT SHALL BE SCHEDULED TO PROVIDE VENTILATION AIR DURING NORMALLY OCCUPIED TIMES.  
 ⑤ HVAC CONTRACTOR SHALL PROVIDE AND INSTALL LP REGULATOR (2 PSI INLET) TO PROVIDE ERV MANUFACTURER'S RECOMMENDED LP PRESSURE TO ERV.

FC CU MINI-SPLIT HEAT PUMP SYSTEM SCHEDULE													
SYMBOL	SERVES	BASIS OF DESIGN			C.F.M. EACH (MAX)	CU COOLING DATA		CU HEATING DATA		CU ELECTRICAL DATA			REMARKS
		MFG.	FC MODEL	CU MODEL		TOTAL M.B.H.	S.E.E.R.	TOTAL M.B.H.	TOTAL H.S.P.F.	TOTAL M.C.A.	TOTAL M.O.P.	VOLTAGE	
FC-1 / CU-1	114	YORK	DHY08NBW21S	DHM18CMB21S	400	18.0	16.0	18.0	8.2	13.0	20.0	230V-1ø-60	①②④⑤⑥
FC-1 / CU-1	113	YORK	DHY09NBW21S	DHM18CMB21S	400	18.0	16.0	18.0	8.2	13.0	20.0	230V-1ø-60	①②④⑤⑥
FC-2 / CU-2	103, 105 & 106	YORK	DHY09NBW21S	DHM30CMB21S	400	29.0	16.0	30.0	8.2	26.0	45.0	230V-1ø-60	①③④⑤⑥
FC-3 / CU-2	110	YORK	DHY12NBW21S	DHM30CMB21S	450	29.0	16.0	30.0	8.2	26.0	45.0	230V-1ø-60	①③④⑤⑥

REMARKS  
 ① SHALL BE PROVIDED WITH LINE SET COVERS, HAIL GUARDS, LOW AMBIENT CONTROL (WIND BAFFLES IF REQUIRED), ELECTRIC EXPANSION VALVE AND HARD WIRED CONTROLLER (THERMOSTAT) FOR EACH INDOOR UNIT, INTEGRATE INTO BMS.  
 ② TWO FC-1 UNITS SHALL BE CONNECTED TO ONE CU-1 UNIT SEE HVAC DRAWING FOR LOCATIONS AND LAYOUT.  
 ③ THREE FC-2 UNITS AND ONE FC-3 UNIT SHALL BE CONNECTED TO ONE CU-2 UNIT SEE HVAC DRAWING FOR LOCATIONS AND LAYOUT.  
 ④ INSTALL CONDENSING UNIT ON EXTERIOR WALL UTILIZING MANUFACTURER'S WALL BRACKET PER MANUFACTURER'S RECOMMENDATIONS, BOTTOM OF UNIT SHALL BE AT LEAST 3 FEET ABOVE GRADE.  
 ⑤ DISCONNECT SWITCH & POWERED CONVENIENCE OUTLET AT EACH CU PROVIDED & INSTALLED BY ELECTRICAL CONTRACTOR, COORDINATE WITH HVAC CONTRACTOR.

IH LP GAS FIRED INFRARED HEATER SCHEDULE													
SYMBOL	BASIS OF DESIGN		SERVING	INPUT (MBH)		TUBE		ELECTRICAL DATA		MOUNTING HEIGHT	WEIGHT (LBS.)	REMARKS	
				HIGH	LOW	LENGTH	TYPE	AMPS	VOLTAGE				
IH-1,2	RE-VERBER-RAY	HL2-SS-30-100	101 & 102	100	65	30'-0"	STRAIGHT	4.8	120V-1ø	20'	195	①②③	

REMARKS  
 ① INFRARED HEATER SHALL HAVE FULLY AUTOMATIC, 3-TRY, 100% SHUT-OFF, DIRECT SPARK ELECTRONIC IGNITION CONTROL. HEATER SHALL BE CONTROLLED BY A HARDWIRED 24V SPACE MOUNTED TEMPERATURE SENSOR (THERMOSTAT).  
 ② INFRARED HEATER SHALL HAVE STAINLESS STEEL PARABOLIC REFLECTOR AND END CAPS.  
 ③ HVAC CONTRACTOR SHALL PROVIDE AND INSTALL LP REGULATOR (2 PSI INLET) TO PROVIDE INFRARED HEATER MANUFACTURER'S RECOMMENDED LP PRESSURE TO INFRARED HEATER.

DUCT DIFFUSER AND GRILLE LEGEND

QUANTITY  
 DEVICE TYPE  
 SIZE  
 AIRFLOW (CFM)  
 BASIS OF DESIGN

DD - DUCT MOUNT DIFFUSER  
 DG - DUCT MOUNT RETURN GRILLE  
 BASIS OF DESIGN  
 A - ANEMOSTAT MODEL IJ-D-P WITH MODEL OB-1X ALUMINUM OPPOSED BLADE VOLUME DAMPER  
 B - ANEMOSTAT MODEL 30/L/O WITH ALUMINUM OPPOSED BLADE VOLUME DAMPER


NOTE: POLE OPERATOR FOR VERTICAL ADJUSTMENTS SHALL BE INCLUDED FOR ALL DUCT MOUNTED DRUM STYLE DIFFUSERS.

HVAC SYMBOLS

- PIPE RISE
- ∩ PIPE DROP
- ⌵ SHUT-OFF VALVE
- ⊞ BALANCING VALVE
- ⊞ GAS SOLENOID VALVE
- ⊞ CEILING SUPPLY DIFFUSER
- ⊞ RETURN GRILLE
- ⊞ EXHAUST GRILLE
- ATC AUTOMATIC TEMPERATURE CONTROL PANEL
- ⊞ JUNCTION BOX
- ⊞ TEMPERATURE CONTROLLER HEATING & COOLING
- TS TEMPERATURE SENSOR
- ⊞ TEMPERATURE CONTROLLER HEATING ONLY
- VD MANUAL VOLUME DAMPER
- ⊞ GAS PRESSURE REGULATOR
- ⊞ PUSHBUTTON SHUTDOWN (MUSHROOM SWITCH)
- ⊞ MOTOR OPERATED DAMPER
- ⊞ DUCT MOUNTED SMOKE DETECTOR
- ⊞ COMBINATION SMOKE/FIRE DAMPER
- ⊞ LIMIT OF DEMOLITION
- ⊞ CONNECT TO EXISTING
- REF- REFRIGERANT PIPING
- LP- PROPANE PIPING
- FLEX DUCT
- CONTROL WIRING
- CD- CONDENSATE DRAIN
- DIRECTION OF FLOW
- FS EXHAUST FAN SWITCH
- MS HOSE REEL MOTOR SWITCH
- ⊞ DUCT MOUNTED CARBON DIOXIDE SENSOR
- ++ TURNING VANES
- ~ PIPE BREAK
- ⊞ STRAINER
- ⊞ PRESSURE GAUGE

NOTE: SYMBOL LEGEND IS GENERAL, ALL SYMBOLS SHOWN MAY NOT BE USED IN DRAWINGS.

NO.	DESCRIPTION	DATE
REVISIONS		

  
 Christian Peter Kita  
 Professional's Signature  
 4/13/18  
 Date  
 COMMONWEALTH OF PENNSYLVANIA  
 DEPARTMENT OF MILITARY AND VETERANS AFFAIRS  
 BUREAU OF MILITARY CONSTRUCTION AND ENGINEERING  
 BLDG. 0-10, FORT INDIANTOWN GAP  
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COMMONWEALTH OF PENNSYLVANIA  
 DEPARTMENT OF GENERAL SERVICES  
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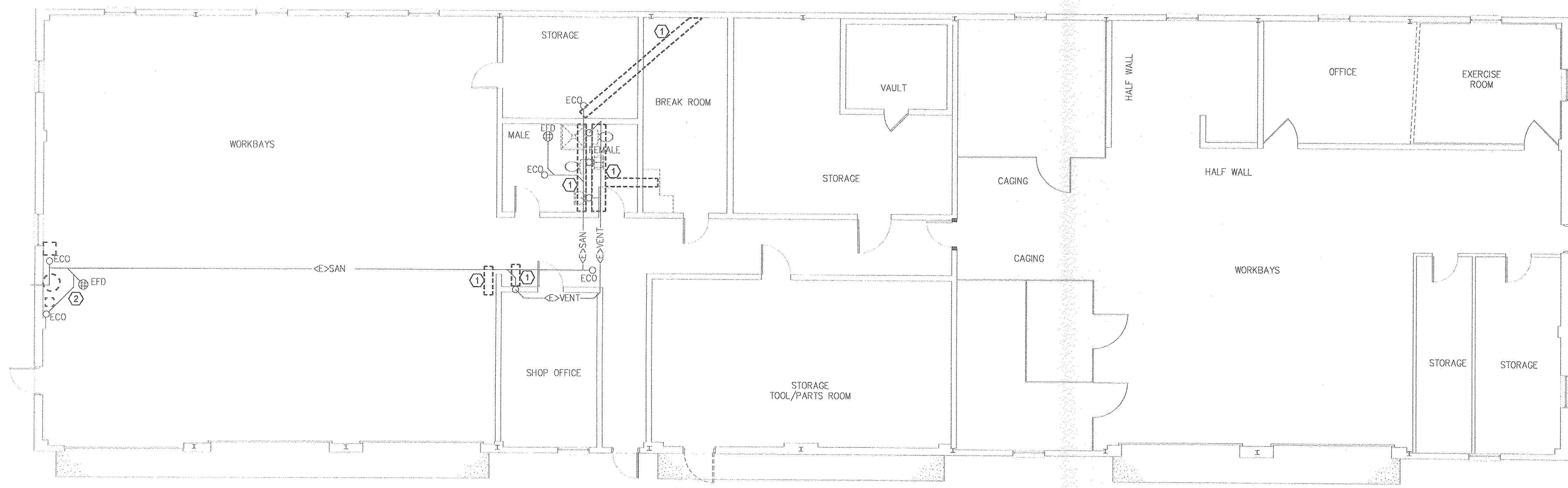
PROJECT NO. D.G.S. A962-58 PH.1  
 DMVA PROJECT NO. 42160105

**HVAC & EXHAUST REPLACEMENT**  
 LOCK HAVEN FMS  
 CLINTON COUNTY, LOCK HAVEN, PENNSYLVANIA

**SCHEDULES & DETAILS**

DRAWN BY M.R.A.	DATE 13-APRIL-2018	DRAWING NO. H.2.1
CHECKED BY C. KITA	SCALE AS NOTED	





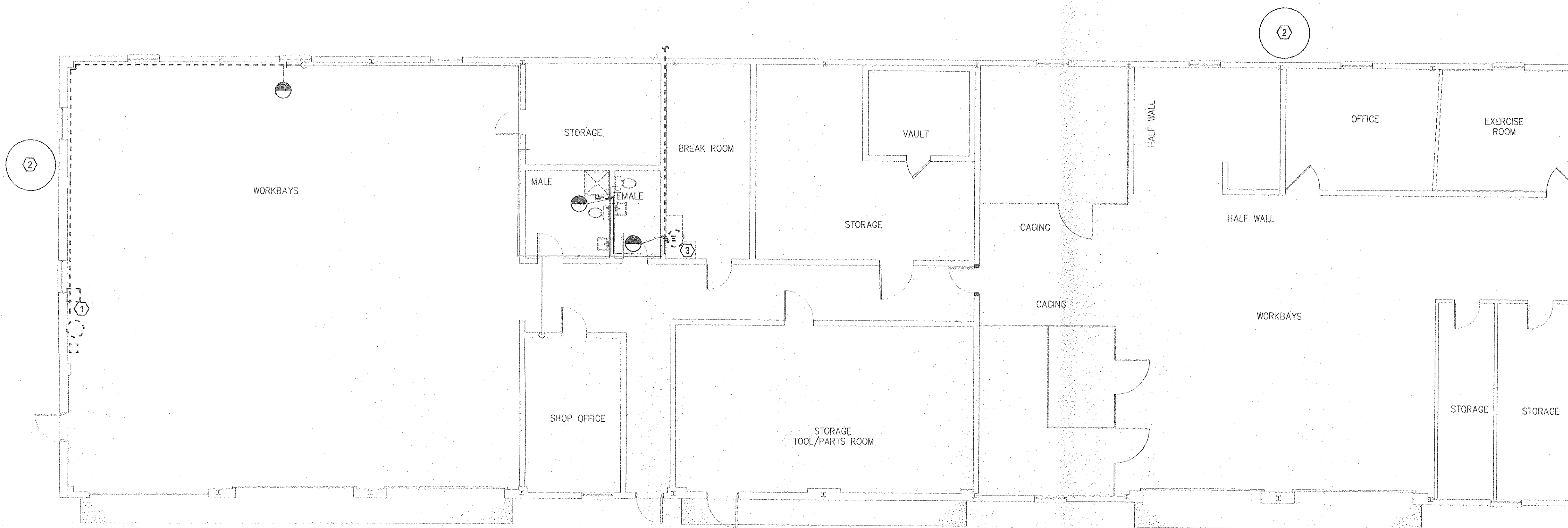
**PLUMBING FLOOR PLAN - DEMO SANITARY & VENT**  
SCALE: 1/8" = 1'-0"

**DEMOLITION NOTES**

- ① PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR SAW CUTTING, EXCAVATING, TRENCHING AND PATCHING AS PER POINT 1 SPECIFICATIONS. LIMITS OF DEMOLITION SHALL BE DETERMINED IN THE FIELD TO ACCOMMODATE THE NEW PLUMBING FIXTURES.
- ② DISCONNECT, REMOVE & DISPOSE OF WATER COOLER, WATER HEATER & SINK. REMOVE & DISPOSE OF ALL RELATED EXPOSED SERVICE PIPING, ANY PIPING IN WALLS OR UNDER FLOOR SHALL BE PROPERLY CAPPED & COVERED.

**GENERAL NOTES**

- 1. LEAD PAINT: WORK SHALL BE CONDUCTED UNDER THE ASSUMPTION THAT ALL SURFACE COATINGS CONTAIN LEAD. ALL DISTURBANCE ACTIVITIES SHALL COMPLY WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL REGULATIONS INCLUDING OSHA 29 CFR 1926.62. WORK ACTIVITIES SHALL ENSURE AREAS BEYOND WORK AREA ARE NOT CONTAMINATED. REFER TO SECTION 01040 OR TOC FOR ANY ADDITIONAL REQUIREMENTS.
- 2. PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SAW CUTTING, EXCAVATION, BACKFILL AND REESTABLISHING CONCRETE FLOORS AND MASONRY WALLS AS PER POINT 1 SPECIFICATIONS AS REQUIRED TO COMPLETE SANITARY AND VENT WORK.
- 3. REMOVE & DISPOSE OF ANY FIXTURE RELATED EXPOSED SERVICE PIPING THAT WILL NOT BE REUSED FOR NEW FIXTURES, ANY PIPING IN WALLS OR UNDER FLOOR SHALL BE PROPERLY CAPPED & COVERED.



**PLUMBING FLOOR PLAN - DEMO WATER**  
SCALE: 1/8" = 1'-0"

**DEMOLITION NOTES**

- ① DISCONNECT, REMOVE & DISPOSE OF WATER COOLER, WATER HEATER & SINK. REMOVE & DISPOSE OF ALL RELATED EXPOSED SERVICE PIPING, ANY PIPING IN WALLS OR UNDER FLOOR SHALL BE PROPERLY CAPPED & COVERED.
- ② PLUMBING CONTRACTOR SHALL DISCONNECT, REMOVE & DISPOSE OF HEATING OIL HEATING OIL TANK, EXTERIOR HEATING OIL PIPING & ACCESSORIES AS PER THE PROCEDURE & DETAILS SHOWN ON THE CIVIL DRAWINGS.
- ③ DISCONNECT, REMOVE & DISPOSE OF WATER HEATER. REMOVE & DISPOSE OF ALL RELATED EXPOSED SERVICE PIPING, ANY PIPING IN WALLS OR UNDER FLOOR SHALL BE PROPERLY CAPPED & COVERED.

**GENERAL NOTES**

- 1. LEAD PAINT: WORK SHALL BE CONDUCTED UNDER THE ASSUMPTION THAT ALL SURFACE COATINGS CONTAIN LEAD. ALL DISTURBANCE ACTIVITIES SHALL COMPLY WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL REGULATIONS INCLUDING OSHA 29 CFR 1926.62. WORK ACTIVITIES SHALL ENSURE AREAS BEYOND WORK AREA ARE NOT CONTAMINATED. REFER TO SECTION 01040 OR TOC FOR ANY ADDITIONAL REQUIREMENTS.
- 2. PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SAW CUTTING, EXCAVATION, BACKFILL AND REESTABLISHING CONCRETE FLOORS AND MASONRY WALLS AS REQUIRED TO COMPLETE SANITARY AND VENT WORK.
- 3. REMOVE & DISPOSE OF ANY FIXTURE RELATED EXPOSED SERVICE PIPING THAT WILL NOT BE REUSED FOR NEW FIXTURES, ANY PIPING IN WALLS OR UNDER FLOOR SHALL BE PROPERLY CAPPED & COVERED.
- 4. PLUMBING & HVAC CONTRACTORS SHALL COORDINATE THE DEMO OF THE HEATING OIL SYSTEM.

NO.	DESCRIPTION	DATE

Professional's Signature: *Christian Peter Kita* Date: *4/13/18*

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS  
BUREAU OF MILITARY CONSTRUCTION AND ENGINEERING  
BLDG. 0-10, FORT MIFKINTOWN GAP  
ANNVILLE, LEBANON COUNTY, PENNSYLVANIA

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF GENERAL SERVICES  
HARRISBURG, PENNSYLVANIA

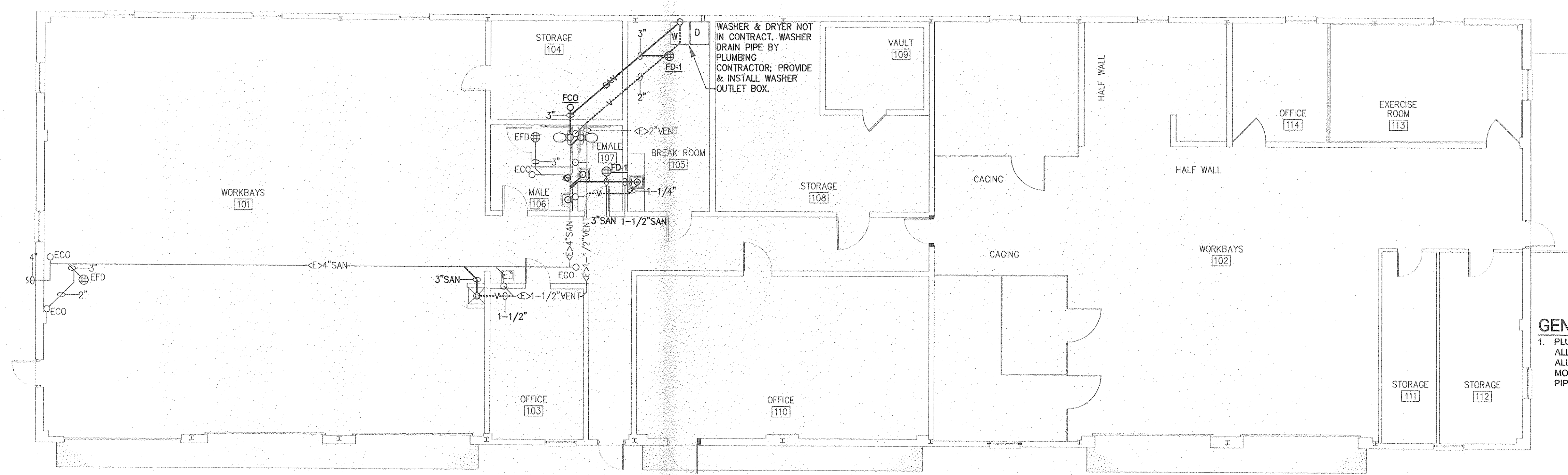
PROJECT NO. D.G.S. A962-58 PH.1  
DMVA PROJECT NO. 42160105

**HVAC & EXHAUST  
REPLACEMENT**  
LOCK HAVEN FMS  
CLINTON COUNTY, LOCK HAVEN, PENNSYLVANIA

**PLUMBING DEMO PLANS**

DRAWN BY M.R.A.	DATE 13-APRIL-2018	DRAWING NO. P.1.1
CHECKED BY C.KITA	SCALE AS NOTED	



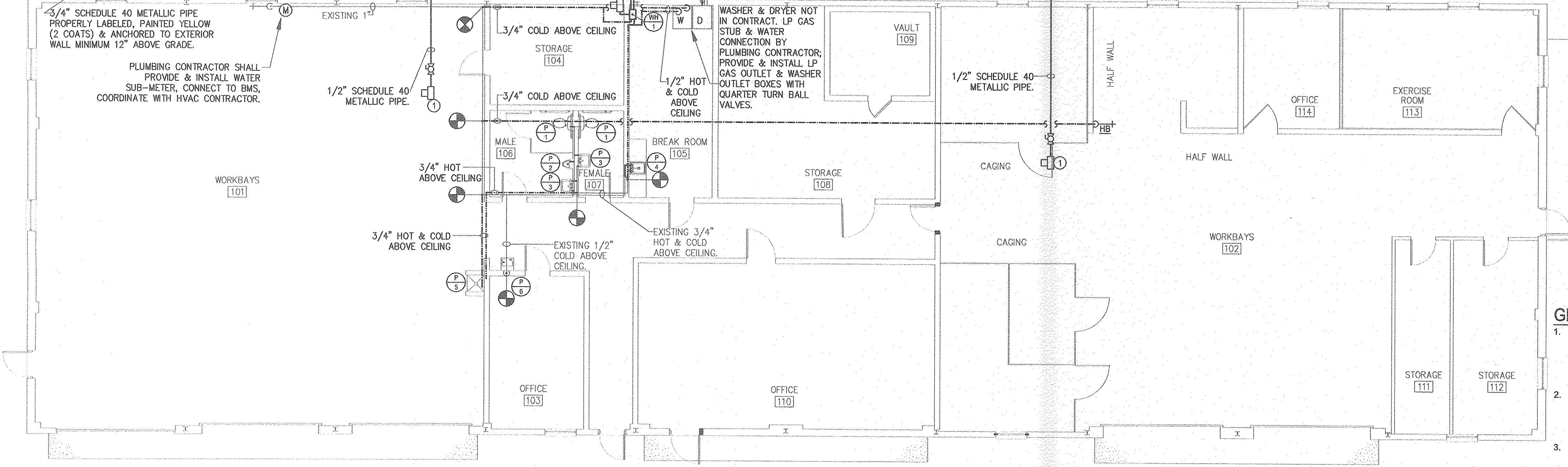


**PLUMBING FLOOR PLAN - SANITARY & VENT**  
SCALE: 1/8" = 1'-0"

**GENERAL NOTES**  
1. PLUMBING CONTRACTOR SHALL PROVIDE AND INSTALL ALL PLUMBING FIXTURES, THIS WORK SHALL INCLUDE ALL LABOR AND MATERIALS REQUIRED TO MAKE ANY MODIFICATIONS TO EXISTING SANITARY AND VENT PIPING.

PLUMBING CONTRACTOR SHALL INSTALL (2) 1000 GALLON LP TANKS PROVIDED BY THE DEPARTMENT.  
 PLUMBING CONTRACTOR SHALL PROVIDE AND INSTALL (2) FIRST STAGE (OPSS) REGULATORS, MANIFOLD WITH SHUTOFF, INITIAL FILL OF TANKS AND BASIS OF DESIGN LEVELCON STM9442A STATIONARY MONITOR, OR APPROVED EQUAL, INTEGRATE INTO BMS.  
 EXISTING CONCRETE PAD. PIPE BOLLARDS BY GENERAL POINT 1 CONTRACTOR.  
 3/4" SDR 11 HDPE COILED LP GAS PIPE UNDERGROUND.  
 PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR TRENCHING, BEDDING, PROPER PIPE PROTECTION AND BACKFILLING AS PER POINT 1 SPECIFICATIONS & PIPE SECTION DETAIL - TYPICAL. SEE CIVIL DRAWINGS, TOP OF PIPE SHALL BE 36" BELOW GRADE MINIMUM.  
 PLUMBING CONTRACTOR SHALL PROVIDE & INSTALL PIPING WITH TRACER WIRE AND WARNING TAPE.

PLUMBING CONTRACTOR SHALL PROVIDE & INSTALL SECOND STAGE GAS PRESSURE REGULATOR WITH 2 PSI OUTLET 700MBH (275.6CFH).  
 3/4" SCHEDULE 40 METALLIC PIPE PROPERLY LABELED, PAINTED YELLOW (2 COATS) & ANCHORED TO EXTERIOR WALL MINIMUM 12" ABOVE GRADE.  
 1/2" SCHEDULE 40 METALLIC PIPE FOR DRYER(W/D). PLUMBING CONTRACTOR SHALL PROVIDE AND INSTALL 2PSI INLET REGULATOR AND 1/2" QUARTER TURN LP GAS SHUT OFF BALL VALVE.  
 3/4" SCHEDULE 40 METALLIC PIPE PROPERLY LABELED, PAINTED YELLOW (2 COATS) & ANCHORED TO EXTERIOR WALL MINIMUM 12" ABOVE GRADE.



**PLUMBING FLOOR PLAN - DOMESTIC WATER & LP GAS**  
SCALE: 1/8" = 1'-0"

**DRAWING NOTES**  
1. HVAC CONTRACTOR SHALL PROVIDE AND INSTALL 2 PSI INLET REGULATORS FOR HVAC EQUIPMENT AND SHALL COORDINATE THIS WORK WITH PLUMBING CONTRACTOR, ALL REGULATORS SHALL BE VENT-LESS OR VENTED TO EXTERIOR.

**GENERAL NOTES**  
1. PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR ALL WORK ASSOCIATED WITH INSTALL OF PROPANE TANKS, LP GAS LINES & VALVES, INCLUDING TRENCHING/BACKFILLING FOR LP GAS LINES UP TO AND INCLUDING SUB-GRADE WORK.  
 2. PLUMBING CONTRACTOR SHALL PROVIDE AND INSTALL ALL PLUMBING FIXTURES, THIS WORK SHALL INCLUDE ALL LABOR AND MATERIALS REQUIRED TO MAKE ANY MODIFICATIONS TO EXISTING WATER PIPING.  
 3. PLUMBING CONTRACTOR SHALL BE AWARE, THE EXISTING WATER COMPANY SERVICE WATER METER FOR THE SITE IS BELOW GROUND IN GRASS AREA IN FRONT OF THE READINESS CENTER BUILDING.

NO.	DESCRIPTION	DATE
REVISIONS		

Christian Peter Kita  
 Professional's Signature      Date 4/13/18

COMMONWEALTH OF PENNSYLVANIA  
 DEPARTMENT OF MILITARY AND VETERANS AFFAIRS  
 BUREAU OF MILITARY CONSTRUCTION AND ENGINEERING  
 BLDG. 0-10, FORT INDIANTOWN GAP  
 ANNVILLE, LEBANON COUNTY, PENNSYLVANIA  
 COMMONWEALTH OF PENNSYLVANIA  
 DEPARTMENT OF GENERAL SERVICES  
 HARRISBURG, PENNSYLVANIA  
 PROJECT NO. D.G.S. A962-58 PH.1  
 DMVA PROJECT NO. 42160105  
**HVAC & EXHAUST REPLACEMENT**  
 LOCK HAVEN FMS  
 CLINTON COUNTY, LOCK HAVEN, PENNSYLVANIA  
**PLUMBING NEW PLANS**

DRAWN BY M.R.A.	DATE 13-APRIL-2018	DRAWING NO. P.2.1
CHECKED BY C. KITA	SCALE AS NOTED	



NOTE: BUILDING POWER IS 240V SINGLE PHASE, THERE IS NO THREE PHASE AVAILABLE.

WATER HEATER SCHEDULE - STORAGE FACILITY												
SYMBOL	BASIS OF DESIGN		MAXIMUM INPUT (MBH)	GPM @ 70° RISE	GPM @ 50° RISE	MAXIMUM GPM	WATER CONN.	LP CONN.	THERMAL EFF. (%)	ELECTRICAL		REMARKS
	MANUFACTURER	MODEL								VOLTS	AMPS	
WH-1	RINNAI	RL94I	199.0	4.8	6.7	9.8	3/4"	3/4"	82	120	2	① ② ③

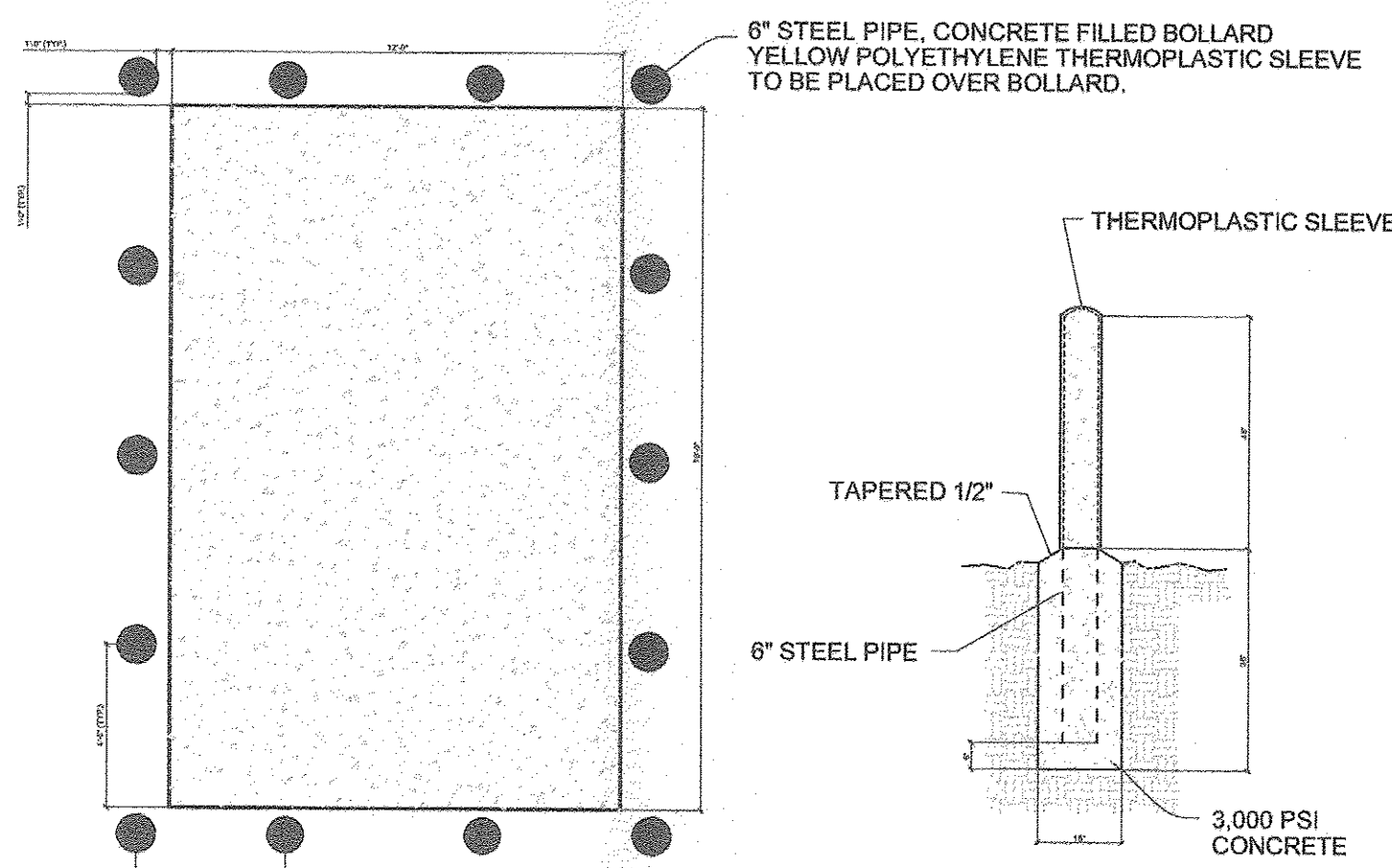
REMARKS

- ① PLUMBING CONTRACTOR SHALL PROVIDE AND INSTALL WITH SERVICE VALVES AND CONCENTRIC WALL TERMINATION KIT.
- ② PLUMBING CONTRACTOR SHALL PROVIDE AND INSTALL WITH LP REGULATOR (2 PSI INLET) TO PROVIDE MANUFACTURER'S RECOMMENDED LP PRESSURE TO WATER HEATER. REGULATOR SHALL BE NON-VENTED OR VENTED TO EXTERIOR.
- ③ PLUMBING CONTRACTOR SHALL CONNECT WATER HEATER TO BMS FOR OUTLET TEMPERATURE.

PLUMBING FIXTURE SCHEDULE								
SYMBOL	FIXTURE DESCRIPTION	C.W.	H.W.	SAN	VENT	MOUNTING	RIM HEIGHT	REMARKS
P-1	WATER CLOSET - ADA - TANK	1/2"	-	4"	2"	FLOOR	17-1/2" (ADA)	①
P-2	URINAL - ADA - FLUSH VALVE	3/4"	-	2"	1-1/2"	WALL	17" (ADA)	①
P-3	LAVATORY - ADA - SINGLE BOWL	1/2"	1/2"	1-1/2"	1-1/4"	WALL	34" (ADA)	①
P-4	SINK - ADA - SINGLE BOWL	1/2"	1/2"	1-1/2"	1-1/4"	COUNTER	34" (ADA)	①
P-5	MOP RECEPTOR	3/4"	3/4"	3"	-	FLOOR	10"	①
P-6	ELECTRIC WATER COOLER - ADA	1/2"	-	1-1/2"	1-1/4"	WALL	32" (ORIFICE)	① ②
FD-1	FLOOR DRAIN	-	-	3"	-	FLOOR	-	①

REMARKS

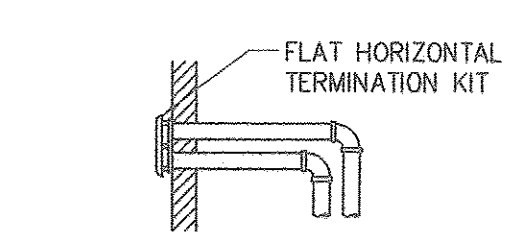
- ① SEE SPECIFICATIONS FOR "BASIS OF DESIGN" FIXTURE MODELS, TRIM AND ACCESSORIES.
- ② SHALL BE ELECTRIC WATER COOLER WITH BOTTLE FILL.



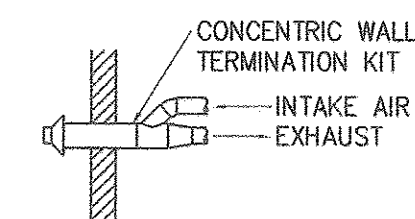
PLAN VIEW  
NOT TO SCALE

BOLLARD DETAIL  
NOT TO SCALE

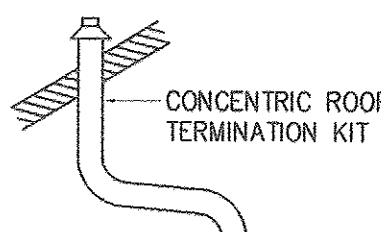
NOTE: ALL WORK ASSOCIATED WITH INSTALL OF CONCRETE BOLLARDS, ADJOINING EARTHMOVING AND SITE FINISHES, RELATED TO THE EXISTING PAD OR BOLLARDS, WILL BE THE RESPONSIBILITY OF THE "1 - GENERAL CONTRACTOR". ALL WORK ASSOCIATED WITH INSTALL OF PROPANE TANKS, LP GAS LINES, TRENCHING/BACKFILLING FOR LP GAS LINES, UP TO AND INCLUDING SUB-GRADE WORK, WILL BE THE RESPONSIBILITY OF THE "3 - PLUMBING CONTRACTOR". THE "3 - PLUMBING CONTRACTOR" WILL ADHERE TO ALL APPLICABLE "1 - GENERAL CONTRACT" SPECIFICATIONS, DRAWINGS, DETAILS AND CONTRACT DOCUMENTATION, INVOLVING ANY EARTHMOVING ACTIVITIES ASSOCIATED WITH LP GAS LINE/EQUIPMENT INSTALL, SEE PIPE TRENCH SECTION - TYPICAL DETAIL ON CIVIL DRAWINGS.



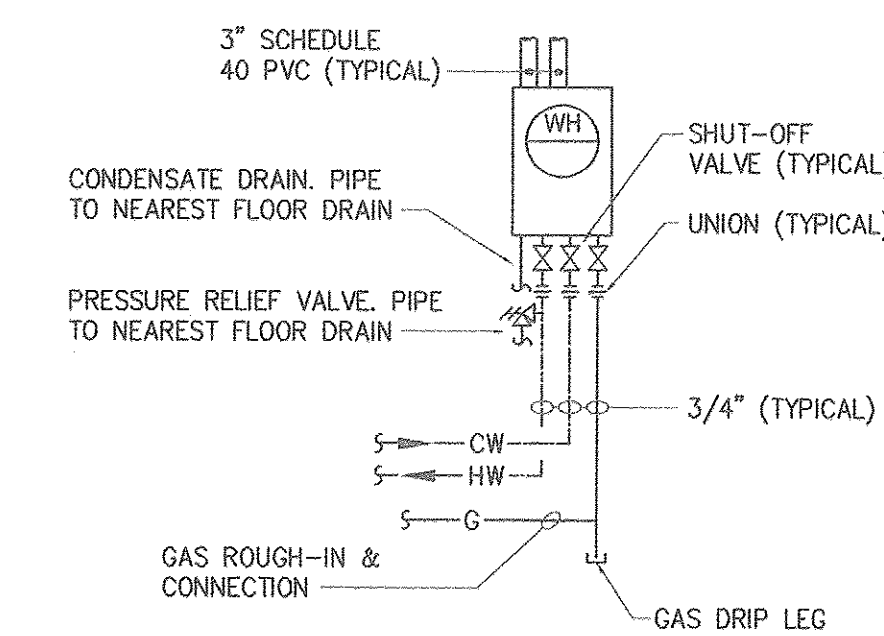
TYPICAL SIDEWALL VENT TERMINATION  
NO SCALE - PLAN VIEW



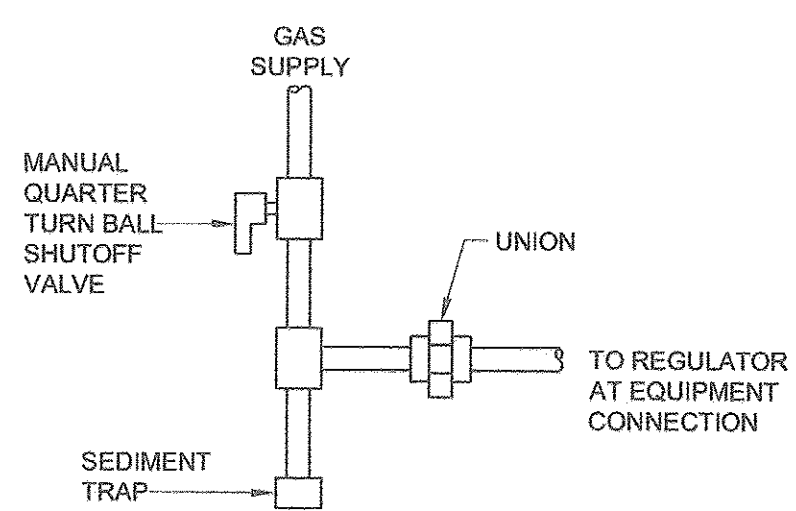
TYPICAL SIDEWALL CONCENTRIC VENT TERMINATION  
NO SCALE - ELEVATION VIEW



TYPICAL ROOF CONCENTRIC VENT TERMINATION  
NO SCALE - ELEVATION VIEW



TYPICAL TANKLESS WATER HEATER DETAIL  
NO SCALE - ELEVATION VIEW



TYPICAL GAS CONNECTION  
NO SCALE - ELEVATION VIEW

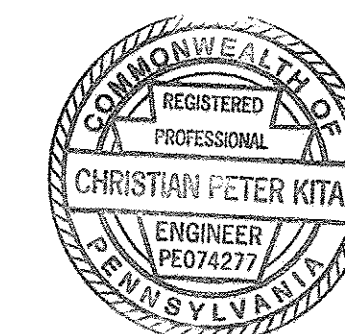
NOTE: PROVIDE REGULATOR (2PSI INLET) AND FLEXIBLE GAS CONNECTOR FOR FINAL CONNECTION TO EQUIPMENT

SYMBOL & ABBREVIATION LEGEND

- |                       |                                    |
|-----------------------|------------------------------------|
| --- (CW) COLD WATER   | ○ PIPE RISE                        |
| --- (HW) HOT WATER    | ○ PIPE DROP (ELBOW)                |
| --- SAN               | ○ PIPE DROP (TEE)                  |
| --- VENT              | ⊗ SHUT-OFF VALVE                   |
| --- CD                | ⊗ STRAINER                         |
| --- FPHB              | ⊗ BALANCING VALVE                  |
| --- EX                | ⊗ QUARTER TURN BALL SHUT-OFF VALVE |
| --- HB                | ⊗ UNION                            |
| --- RPZ               | ⊗ PIPE BREAK                       |
| --- WHA               | ⊗ SUB-METER                        |
| --- FCO               | ⊗ FLOOR DRAIN                      |
| --- WCO               | ⊗ LIMIT OF DEMOLITION              |
| --- TWV               | ⊗ CONNECT TO EXISTING              |
| --- DIRECTION OF FLOW | ⊗ GAS REGULATOR                    |

NOTE: SYMBOL LEGEND IS GENERAL, ALL SYMBOLS SHOWN MAY NOT BE USED IN DRAWINGS.

NO.	DESCRIPTION	DATE
REVISIONS		



Professional's Signature: *Christian Peter Kita* Date: *4/13/18*

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS  
BUREAU OF MILITARY CONSTRUCTION AND ENGINEERING  
BLDG. 0-10, FORT INDIANTOWN GAP  
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COMMONWEALTH OF PENNSYLVANIA  
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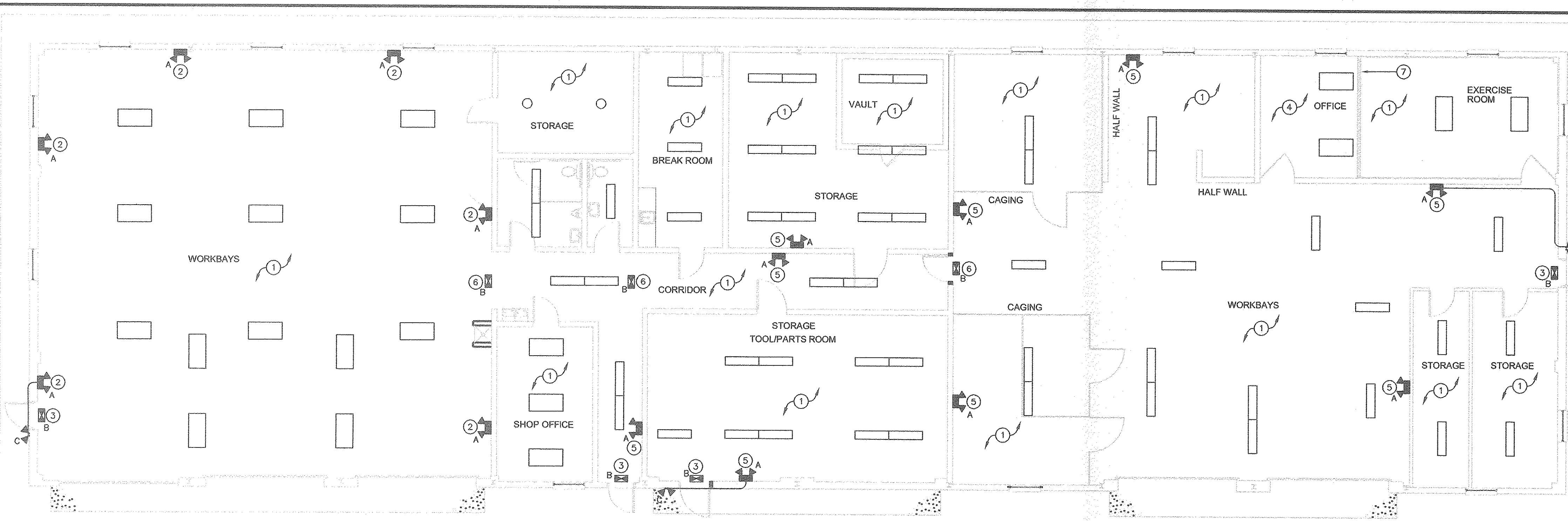
PROJECT NO. D.G.S. A962-58 PH.1  
DMVA PROJECT NO. 42160105

HVAC & EXHAUST  
REPLACEMENT  
LOCK HAVEN FMS  
CLINTON COUNTY, LOCK HAVEN, PENNSYLVANIA

SCHEDULES & DETAILS

DRAWN BY M.R.A.	DATE 13-APRIL-2018	DRAWING NO. P.3.1
CHECKED BY C. KITA	SCALE AS NOTED	





**LIGHTING PLAN**  
SCALE: 1/8" = 1'-0"

**GENERAL NOTES FOR ALL ELECTRICAL PLANS**

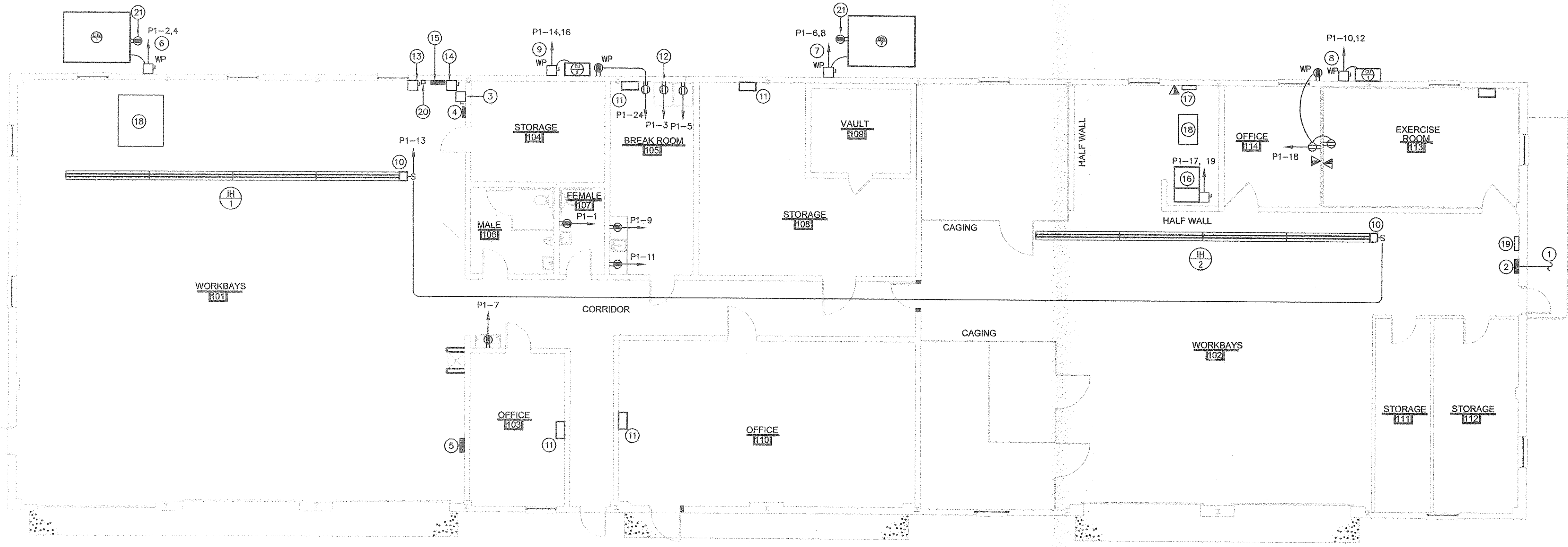
1. ALL WORK MUST MEET UCC REQUIREMENTS. ALL WORK MUST MEET NEC, 2008.
2. THE ELECTRICAL CONTRACTOR (EC) SHALL PROVIDE ALL MATERIALS AND WORK FOR A COMPLETE AND OPERATIONAL SYSTEM. THE EC IS RESPONSIBLE FOR ALL "WAYS AND MEANS OF CONSTRUCTION" NOT SPECIFICALLY DETAILED, I.E. JUNCTION BOXES, ETC.
3. ALL ELECTRICAL EQUIPMENT AND/OR CONNECTIONS ARE BY E.C. UNLESS NOTED OTHERWISE. THE E.C. SHALL BECOME FAMILIAR WITH ALL OF THE CONTRACT DOCUMENTS TO VERIFY ALL ELECTRICAL REQUIREMENTS REGARDING OTHER TRADES, (I.E. MECHANICAL EQUIPMENT - H.C. FURNISHES AND INSTALLS, E.C. MAKES ELECTRICAL CONNECTIONS)
4. ALL ELECTRICAL PENETRATIONS THROUGH CORRIDORS, MECHANICAL ROOMS, ELECTRICAL ROOMS, STAIR TOWERS, AND PENETRATIONS FROM FLOOR TO FLOOR SHALL BE 1 HOUR RATED AND SHALL BE BY MANUFACTURER'S DETAILS. THE DETAILS SHALL MEET OR EXCEED RATINGS OF CONSTRUCTION BEING PENETRATED. PENETRATION DETAILS SHALL BE EXACTLY AS TESTED BY AN APPROVED TESTING LABORATORY OR AGENCY AND SHALL INCLUDE THEIR SYSTEM NUMBERS ON SUBMITTALS.
5. WHEN THE PHRASE "EXTEND AND CONNECT" IS USED IN ANY VARIATION, IT SHALL MEAN TO PROVIDE CONDUIT AND WIRE AS INDICATED ON THE PANEL SCHEDULE FOR THE ASSOCIATED CIRCUIT, TO THE POINT INDICATED EITHER IN THE NOTE OR ON THE DRAWING. PROVIDE ALL TERMINATIONS, BOXES, CONDUIT, WIRE, CONNECTORS, ETC. FOR A COMPLETE AND OPERATIONAL SYSTEM.
6. UNDER NO CIRCUMSTANCE SHALL THE E.C. INSTALL MORE THAN 9 CURRENT CARRYING CONDUCTORS IN A SINGLE RACEWAY WITHOUT PRIOR APPROVAL FROM THE DESIGN ENGINEER. FOR LIGHTING CIRCUITS, THE NEUTRAL CONDUCTOR SHALL BE CONSIDERED A CURRENT CARRYING CONDUCTOR. THE CONTRACTOR MUST SUBMIT HIS WIRE DERATING PLAN FOR APPROVAL AND UNDER NO CIRCUMSTANCE SHALL THE DERATED VALUE BE LESS THAN THE CIRCUIT BREAKER FEEDING THE CIRCUIT.
7. ALL RECEPTACLES AND DATA OUTLETS SHALL BE MOUNTED AT 18" A.F.F. UNLESS NOTED OTHERWISE.
8. ALL CIRCUITS SHALL HAVE A DEDICATED NEUTRAL CONDUCTOR. SHARING OF NEUTRAL CONDUCTOR IS NOT PERMITTED.
9. ALL EXISTING RECEPTACLES AND DATA/TELEPHONE OUTLETS ARE EXISTING TO REMAIN UNLESS NOTED OTHERWISE.
10. UNLESS NOTED OTHERWISE, ALL TEL/DATA OUTLETS SHOWN ON THESE PLANS SHALL CONSIST OF OUTLET BOX, TWO JACKS, 1" C. UP TO ABOVE NEAREST ACCESSIBLE CEILING, TWO CAT6 UTP CABLE (COLOR GREEN). TERMINATE ALL CABLES IN PATCH PANEL NEAR DEMARK. FURNISH AND INSTALL (PROVIDE) CORRECT NUMBER OF JACKS AT EACH LOCATION (TIA 568B). SEE SYMBOL SCHEDULE. IN AREAS WHERE CABLE CANNOT BE RUN IN WALLS AND ABOVE ACCESSIBLE CEILINGS, OUTLETS SHALL BE SURFACE MOUNTED AND RUN IN CONDUIT. ALL CABLE SHALL BE PLENUM RATED.

**LIGHTING PLAN NOTES**

1. EXISTING LIGHTING FIXTURES AND SWITCHING IN THIS AREA ARE TO REMAIN UNLESS NOTED OTHERWISE.
2. EXISTING EMERGENCY BATTERY PACK TO BE REMOVED AND REPLACED WITH NEW. E.C. SHALL CONNECT 2#12 W/G TO UNSWITCHED HOT LEG OF LIGHTING CIRCUIT SERVING THIS AREA. RE-USE EXISTING CONDUIT AND WIRING TO THE EXTENT POSSIBLE.
3. EXISTING EMERGENCY EXIT LIGHT TO BE REMOVED AND REPLACED WITH NEW. E.C. SHALL CONNECT 2#12 W/G TO UNSWITCHED HOT LEG OF LIGHTING CIRCUIT SERVING THIS AREA. RE-USE EXISTING CONDUIT AND WIRING TO THE EXTENT POSSIBLE.
4. E.C. SHALL MOVE EXISTING LIGHTING FIXTURES OVER TOWARD CENTER OF THE ROOM AFTER INSTALLATION OF WALL AND ACOUSTICAL CEILING. EXTEND AND CONNECT WIRING AS REQUIRED.
5. NEW EMERGENCY BATTERY PACK E.C. SHALL EXTEND AND CONNECT WITH 2#12 W/G TO UNSWITCHED HOT LEG OF LIGHTING CIRCUIT SERVING THIS AREA. T
6. NEW EMERGENCY EXIT SIGN. SEE LIGHTING FIXTURE SCHEDULE ON DRAWING E.2.1. EXTEND AND CONNECT 2 #12 W/G TO UNSWITCHED HOT LEG OF LIGHTING CIRCUIT SERVING THE AREA.
7. NEW WALL BY G.C.

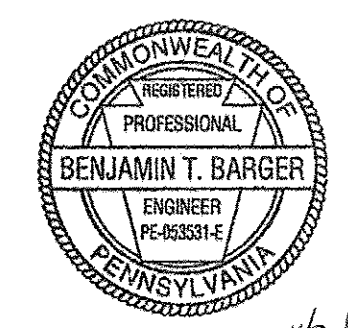
**POWER PLAN NOTES**

1. EXISTING OVERHEAD FEED FROM ADJACENT BUILDING TO BE DISCONNECTED AND REMOVED IN ITS ENTIRETY.
2. EXISTING PANEL BOARD AND BRANCH CIRCUITS TO REMAIN. PANEL BOARD SHALL BE RE-FED FROM NEW DISCONNECT. SEE NEW ELECTRICAL RISER DIAGRAM.
3. EXISTING 200A SERVICE DISCONNECT TO REMAIN BUT TO BE DISCONNECTED FROM SERVICE ENTRANCE CONDUCTORS. CONTRACTOR SHALL RE-CONNECT DISCONNECT AND SERVICE ENTRANCE GROUND AS INDICATED. SEE NEW ELECTRICAL RISER DIAGRAM.
4. EXISTING SUB-PANEL AND BRANCH CIRCUITS TO REMAIN.
5. EXISTING PANEL BOARD AND BRANCH CIRCUITS TO REMAIN.
6. NEW ENERGY RECOVERY VENTILATOR, ERV-1, BY MECHANICAL CONTRACTOR. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL A 60A-2P, WEATHERPROOF, FUSED DISCONNECT SWITCH, FUSE AT 50A.
7. NEW ENERGY RECOVERY VENTILATOR, ERV-2, BY MECHANICAL CONTRACTOR. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL A 60A-2P, WEATHERPROOF, FUSED DISCONNECT SWITCH, FUSE AT 40A.
8. NEW CONDENSING UNIT, CU-1, BY MECHANICAL CONTRACTOR. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL A 30A-2P, WEATHERPROOF, FUSED DISCONNECT SWITCH, FUSE AT 20A.
9. NEW CONDENSING UNIT, CU-2, BY MECHANICAL CONTRACTOR. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL A 60A-2P, WEATHERPROOF, FUSED DISCONNECT SWITCH, FUSE AT 45A.
10. NEW GAS FIRED INFRARED HEATING UNIT, IH-1, BY MECHANICAL CONTRACTOR. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL A 20A-1P, THERMAL SWITCH, CIRCUIT AS INDICATED.
11. NEW FAN COIL UNIT BY THE MECHANICAL CONTRACTOR. PER BASIS OF DESIGN, UNIT TO BE POWERED FROM ASSOCIATED CONDENSING UNIT. THE ELECTRICAL CONTRACTOR SHALL VERIFY EXACT REQUIREMENTS WITH MECHANICAL CONTRACTOR.
12. DRYER OUTLET, 120V-1Ø.
13. NEW 400A-2P, SERVICE ENTRANCE DISCONNECT. FUSE AT 400A. SEE ELECTRICAL RISER DIAGRAM ALSO.
14. NEW 200A-2P, SERVICE ENTRANCE DISCONNECT. FUSE AT 200A. SEE ELECTRICAL RISER DIAGRAM ALSO.
15. NEW 240V, 225A-1Ø, PANELBOARD, P1. SEE ELECTRICAL RISER DIAGRAM AND ASSOCIATED PANEL SCHEDULE.
16. NEW VEHICLE EXHAUST SYSTEM WITH INTEGRAL DISCONNECT BY H.C. E.C. SHALL FURNISH AND INSTALL POWER WIRING AS INDICATED. ALL CONTROL WIRING FOR SYSTEM SHALL BE BY H.C.
17. EXISTING HVAC CONTROL PANEL. E.C. SHALL FURNISH AND INSTALL BOX WITH (2) CAT 6 DATA JACKS, CABLES, AND COVER PLATE. RUN CAT6 CABLES FROM HERE TO LOCATION OF ELECTRIC SMART METER.
18. EXISTING FURNACE TO BE REMOVED BY THE H.C. E.C. SHALL DISCONNECT POWER AND REMOVE ALL ASSOCIATED CONDUIT AND WIRING BACK TO POINT OF SUPPLY. LABEL EXISTING CIRCUIT BREAKER(S) AS SPARE.
19. EXISTING TELEPHONE DEMARK WITH PATCH PANELS ABOVE TO REMAIN.
20. E.C. SHALL FURNISH AND INSTALL A NEW "SMART METER" WITH APPROPRIATELY SIZED CURRENT TRANSFORMERS. SEE ELECTRICAL SPECIFICATIONS. CONNECT VIA P1-20.
21. CONVENIENCE OUTLET PROVIDED AND WIRED INTEGRAL TO EQUIPMENT PROVIDED BY H.C.



**POWER PLAN**  
SCALE: 1/8" = 1'-0"

NO.	DESCRIPTION	DATE
REVISIONS		



*Benjamin T. Barger*  
Professional's Signature Date 4/30/18

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS  
BUREAU OF MILITARY CONSTRUCTION AND ENGINEERING  
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COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF GENERAL SERVICES  
HARRISBURG, PENNSYLVANIA

PROJECT NO. D.G.S. A962-58 PH.1  
DMVA PROJECT NO. 42160105

**HVAC & EXHAUST REPLACEMENT**  
LOCK HAVEN FMS  
CLINTON COUNTY, LOCK HAVEN, PENNSYLVANIA

**LIGHTING & POWER PLAN**

**VERIFY SCALE**  
BAR IS ONE (1) INCH LONG ON ORIGINAL DRAWING:  
0 1  
IF BAR IS NOT ONE (1) INCH LONG, ADJUST SCALE ACCORDINGLY

CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS. VARIANCE FROM CONTRACT DOCUMENTS NOT PERMITTED WITHOUT BUREAU OF ENGINEERING AND ARCHITECTURE APPROVAL.

DRAWN BY <b>K. MCCLAIN</b>	DATE <b>13-APRIL-2018</b>	DRAWING NO. <b>E.1.1</b>
CHECKED BY <b>B. BARGER</b>	SCALE <b>AS NOTED</b>	



ABBREVIATIONS

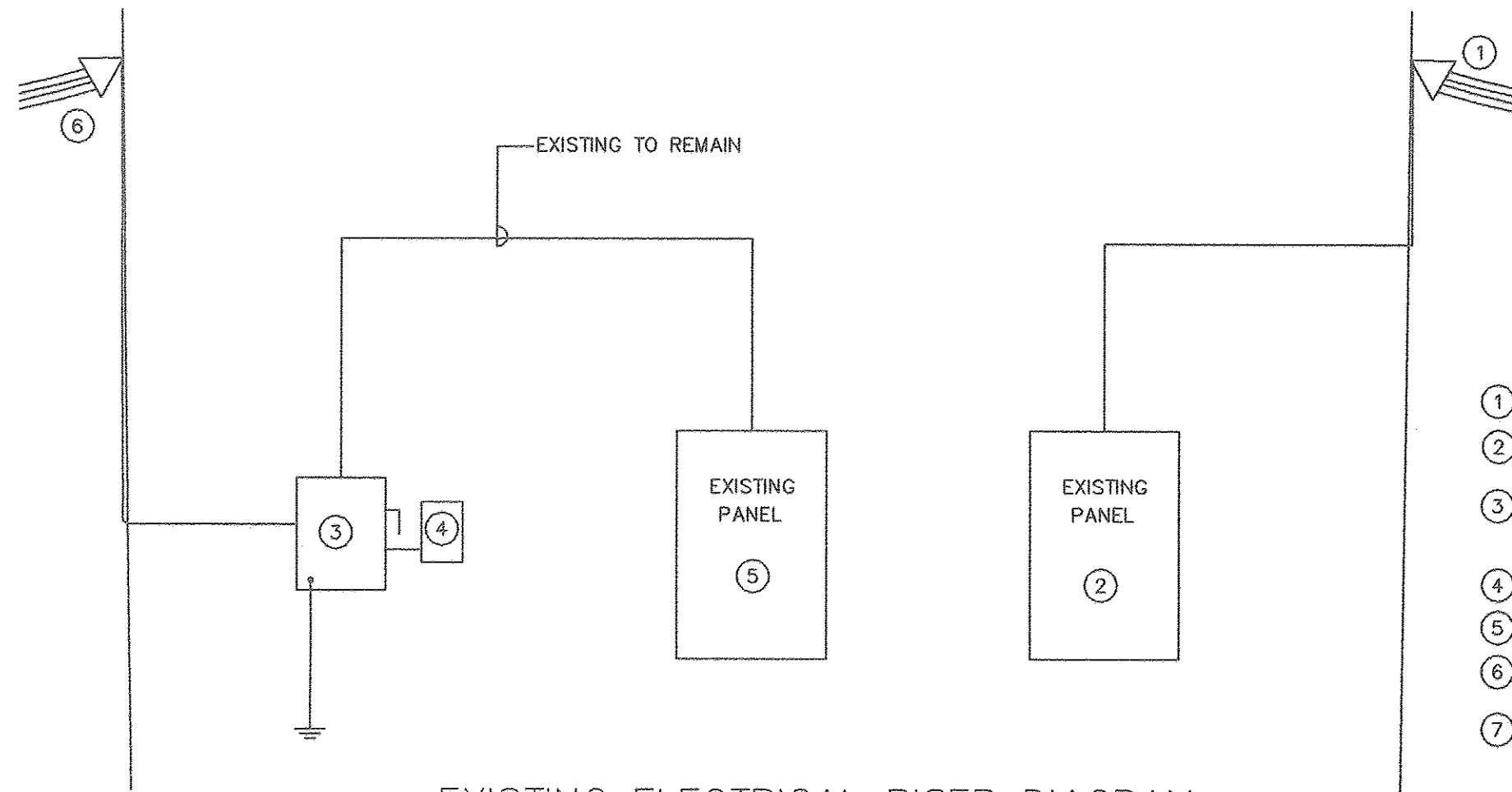
- A AMPERE
- AFV ABOVE FINISHED FLOOR
- C CONDUIT
- CKT CIRCUIT
- CT CURRENT TRANSFORMER
- DWG DRAWING
- EC ELECTRICAL CONTRACTOR
- ETR EXISTING TO REMAIN
- FT FEET
- GC GENERAL CONTRACTOR
- GND GROUND
- HC HEATING CONTRACTOR
- HP HORSEPOWER
- KW KILOWATT
- MC MECHANICAL CONTRACTOR
- MLO MAIN LUG ONLY
- Ø PHASE
- P POLE
- PC PLUMBING CONTRACTOR
- PBL PANELBOARD
- RGS RIGID GALVANIZED STEEL CONDUIT
- TV TELEVISION
- V VOLT
- W WATT OR WIRE
- W/G WITH GROUND
- W/P WEATHER-PROOF

SYMBOLS

- NOTE 1
- LIGHT FIXTURE, CEILING
  - SPLIT-WIRED LIGHT FIXTURE
  - LIGHT FIXTURE, WALL
  - S SINGLE POLE SWITCH
  - S2 DOUBLE POLE SWITCH
  - S3 THREE-WAY SWITCH
  - S4 FOUR-WAY SWITCH
  - S0 DIMMER SWITCH
  - DUPLEX RECEPTACLE
  - C - MOUNTED ABOVE COUNTER  
CL - CLOCK HANGER RECEPTACLE
  - SPECIAL PURPOSE RECEPTACLE
  - QUADRUPLUX RECEPTACLE
  - GROUND FAULT INTERRUPTING RECEPTACLE  
WP - WEATHERPROOF
  - ISOLATED GROUND RECEPTACLE
  - TELEPHONE/DATA OUTLET - TWO CABLES AND JACKS
  - Stp MANUAL STARTER WITH THERMAL OVERLOAD & PILOT LIGHT
  - Sm MANUAL STARTER WITHOUT THERMAL OVERLOAD
  - DISCONNECT SWITCH
  - CONTACTOR
  - AC MAGNETIC STARTER
  - COMBINATION STARTER/DISCONNECT
  - MOTOR
  - JUNCTION BOX
  - FIRE ALARM PULL STATION
  - FIRE ALARM HORN/STROBE
  - FIRE ALARM HORN/STROBE
  - SMOKE DETECTOR
  - HEAT DETECTOR
  - DUCT DETECTOR
  - HOMERUN TO PANEL INDICATED, NOTE 1
  - EMERGENCY LIGHTING CIRCUIT
  - CIRCUIT UNDERGROUND OR UNDERFLOOR
  - PANELBOARD
  - EMERGENCY BATTERY PACK
  - REMOTE EMERGENCY HEAD
  - EXIT SIGN

NOTE:  
1. THIS SYMBOL SCHEDULE IS TYPICAL. NOT ALL SYMBOLS MAY BE USED.

LIGHTING FIXTURE SCHEDULE								
I.D.	DESCRIPTION	MANUFACTURER			CAT. NO.	LAMPS	MTG.	REMARKS
		BASIS OF DESIGN	ALTERNATE	ALTERNATE				
A	EMERGENCY BATTERY PACK	DUAL LITE			LM 50 N 12V I SRHSW1212	HALOGEN	WALL	
B	EMERGENCY EXIT LIGHT	DUAL LITE			EVE U R W E I	LED	WALL	
C	REMOTE EMERGENCY LIGHT	DUAL LITE			OMS D W 1212	HALOGEN	WALL	



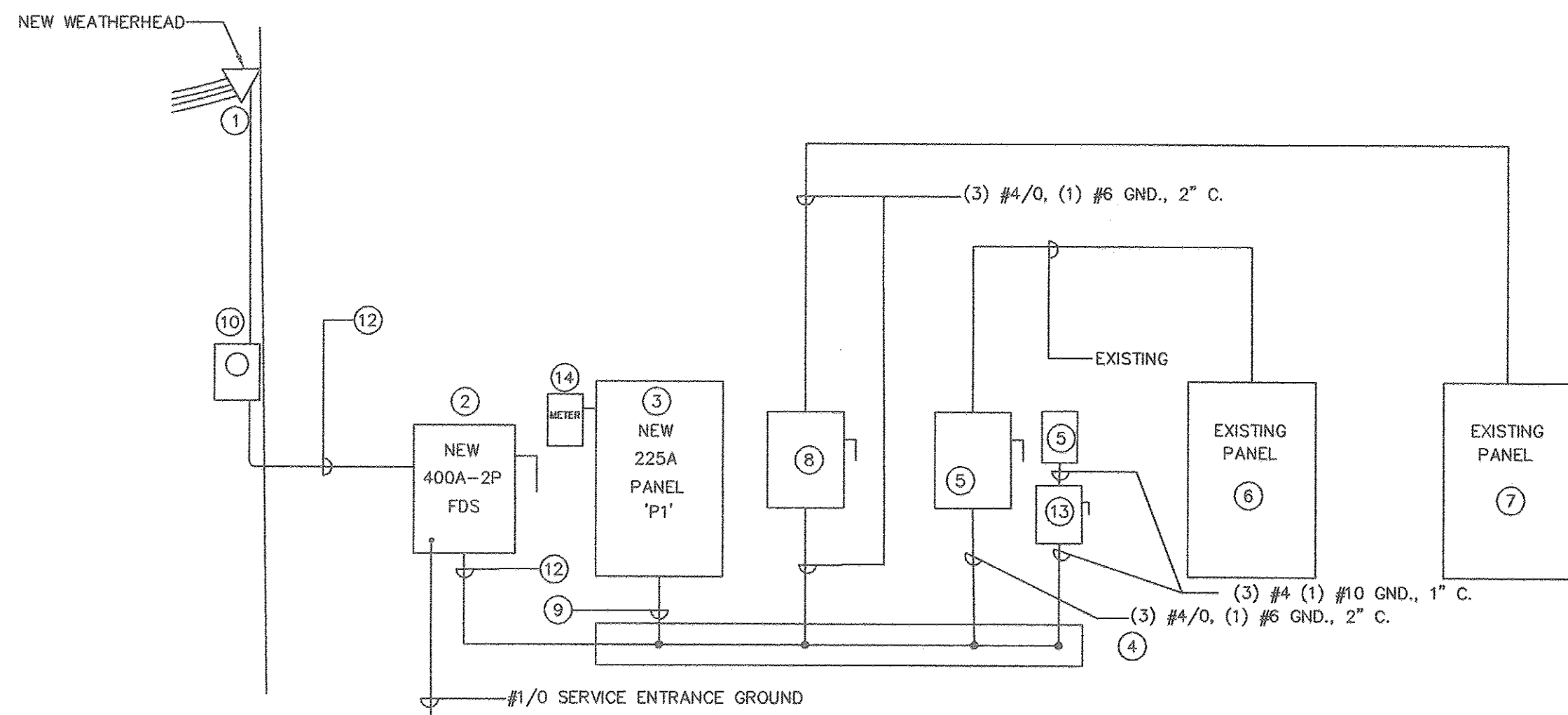
EXISTING ELECTRICAL RISER DIAGRAM

NO SCALE

EXISTING ELECTRICAL RISER DIAGRAM NOTES

- 1 EXISTING OVERHEAD FEED FROM ADJACENT BUILDING TO BE DISCONNECTED AND REMOVED IN ITS ENTIRETY.
- 2 EXISTING PANEL BOARD AND BRANCH CIRCUITS TO REMAIN. PANEL BOARD SHALL BE RE-FED FROM NEW DISCONNECT. SEE NEW ELECTRICAL RISER DIAGRAM.
- 3 EXISTING 200A SERVICE DISCONNECT TO REMAIN BUT TO BE DISCONNECTED FROM SERVICE ENTRANCE CONDUCTORS. CONTRACTOR SHALL RE-CONNECT DISCONNECT AND SERVICE ENTRANCE GROUND AS INDICATED. SEE NEW ELECTRICAL RISER DIAGRAM.
- 4 EXISTING SUB-PANEL TO BE DISCONNECTED AND RECONNECT VIA FDS AS INDICATED ON NEW WORK RISER.
- 5 EXISTING PANEL BOARD AND BRANCH CIRCUITS TO REMAIN.
- 6 EXISTING WEATHERHEAD, CONDUIT, SERVICE ENTRANCE CONDUCTORS AND METER BASE TO BE DISCONNECTED AND REMOVED. SEE NEW WORK ELECTRICAL RISER DIAGRAM FOR CONNECTION TO NEW PPL TRANSFORMER.
- 7 EXISTING UTILITY COMPANY POWER POLE TO REMAIN.

NOTE	CIRCUIT	NEW PANEL: 'P1'				POLES: 42				CIRCUIT	NOTE	
		EQUIPMENT	BREAKER	FEEDER		EQUIPMENT	BREAKER	FEEDER				
		MAIN C/B: 225A FRAME: 225A NOMINAL				VOLTAGE: 120/208-1Ø-3W						
				#A AMPS	#B AMPS							
	1	RECEPTACLE	20A-1P	2#12 W/G	1.5	31.7					2	
	3	RECEPTACLE - GAS DRYER	20A-1P	2#12 W/G	1.5	31.7	2#6 W/G	50A-2P			4	
	5	CLOTHES WASHER	20A-1P	2#12 W/G	6.0	22.7					6	
	7	WATER COOLER	20A-1P	2#12 W/G	7.0	22.7	2#8 W/G	40A-2P			8	
	9	COFFEE MAKER	20A-1P	2#12 W/G	8.0	10.4					10	
	11	MICROWAVE	20A-1P	2#12 W/G			2#12 W/G	20A-2P			12	
	13	INFRARED HEATERS	20A-1P	2#12 W/G	4.0	20.8					14	
	15	GAS WATER HEATER	20A-1P	2#12 W/G	2.0	20.8	2#8 W/G	45A-2P			16	
	17				22.0	3.0					18	
	19	VEHICLE EXHAUST SYSTEM	60A-2P	3#6 W/G			2#12 W/G	20A-1P			20	
	21	SPARE	20A-1P		0	0					22	
	23	SPARE	20A-1P		0	0	2.0	2#12 W/G	20A-1P		24	
	25	SPARE	20A-1P		0	0					26	
	27	SPARE	20A-1P		0	0					28	
	29	BUSSED SPACE			0	0					30	
	31	BUSSED SPACE			0	0					32	
	33	BUSSED SPACE			0	0					34	
	35	BUSSED SPACE			0	0					36	
	37	BUSSED SPACE			0	0					38	
	39	BUSSED SPACE			0	0					40	
	41	BUSSED SPACE			0	0					42	
		TOTAL CONNECTED AMPS/LEG			130.1		129.1					



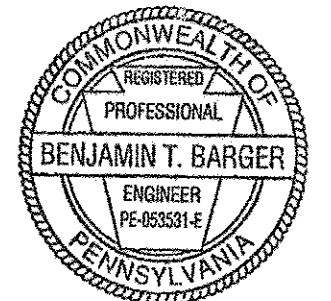
NEW ELECTRICAL RISER DIAGRAM

NO SCALE

NEW ELECTRICAL RISER DIAGRAM NOTES

- 1 NEW WEATHERHEAD, CONDUIT AND SERVICE MAST FOR NEW 400A SERVICE. ALLOW SLACKS CONDUCTORS TO ALLOW FOR CONNECTION TO NEW POLE MOUNTED PPL TRANSFORMER. CONTRACTOR HAS THE OPTION TO FURNISH AND INSTALL PARALLEL CONDUCTORS CONSISTING OF 2 SETS OF (3) #3/0 AND TWO WEATHERHEADS INSTEAD OF THE 500 KCMIL CONDUCTORS INDICATED. COORDINATE WITH PPL.
- 2 FURNISH AND INSTALL A NEW 400A-2P FUSED SERVICE ENTRANCE DISCONNECT SWITCH, FUSED AT 400A.
- 3 FURNISH AND INSTALL A NEW 240V-1Ø, 225A PANEL BOARD 'P1'. SEE SCHEDULE THIS DRAWING.
- 4 FURNISH AND INSTALL A NEW 12" X 12" METAL WIREWAY WITH HINGED COVER.
- 5 EXISTING DISCONNECT AND ADJACENT SUB-PANEL. DISCONNECT THE EXISTING SUB-PANEL AND RE-FEED FROM TAP IN WIREWAY VIA A NEW 60A-2P FDS AS INDICATED.
- 6 EXISTING PANEL BOARD, CONDUIT AND FEEDER TO REMAIN.
- 7 EXISTING PANEL BOARD TO REMAIN. FURNISH AND INSTALL NEW CONDUIT AND WIRING FROM NEW DISCONNECT SWITCH AS INDICATED.
- 8 FURNISH AND INSTALL A NEW 200A-2P FDS, FUSE AT 200A. FURNISH AND INSTALL NEW CONDUIT AND CONDUCTORS AS INDICATED.
- 9 FURNISH AND INSTALL (3) #1, (1) #8 GND., 1 1/2" C.
- 10 FURNISH AND INSTALL A NEW 400A METER BASE PER PPL SPECIFICATIONS. FURNISH AND INSTALL CURRENT TRANSFORMER CABINET IF REQUIRED BY PPL.
- 11 EXISTING UTILITY COMPANY POWER POLE TO REMAIN. COORDINATE WITH PPL FOR NEW SERVICE ENTRANCE. PPL JOB #58273867. PPL SCHEDULER: MIKE KLINGER (570 368-4532).
- 12 FURNISH AND INSTALL (3) 500 KCMIL, (1) 1/0 GND., 3" CONDUIT OR 2 SETS OF (3) #3/0, WITH GND. 2" CONDUIT.
- 13 NEW 60A-2P FDS. FUSE AT 60A.
- 14 NEW SMART METER AND CURRENT TRANSFORMERS BY E.C. MOUNT CURRENT TRANSFORMERS IN WIREWAY BELOW.

NO.	DESCRIPTION	DATE
REVISIONS		



Professional's Signature Date

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS  
BUREAU OF MILITARY CONSTRUCTION AND ENGINEERING  
BLDG. 0-10, FORT INDIANTOWN GAP  
ANNVILLE, LEBANON COUNTY, PENNSYLVANIA

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF GENERAL SERVICES  
HARRISBURG, PENNSYLVANIA

PROJECT NO. D.G.S. A962-58 PH.1  
DMVA PROJECT NO. 42160105

HVAC & EXHAUST  
REPLACEMENT

LOCK HAVEN FMS  
CLINTON COUNTY, LOCK HAVEN, PENNSYLVANIA

DIAGRAMS & SCHEDULES

**VERIFY SCALE**

BAR IS ONE (1) INCH LONG  
ON ORIGINAL DRAWING.

0 1

IF BAR IS NOT ONE (1) INCH LONG,  
ADJUST SCALE ACCORDINGLY

CONTRACTOR SHALL FIELD VERIFY  
ALL DIMENSIONS.  
VARIANCE FROM CONTRACT  
DOCUMENTS NOT PERMITTED  
WITHOUT BUREAU OF ENGINEERING  
AND ARCHITECTURE APPROVAL.

DRAWN BY K. MCCLAIN	DATE 13-APRIL-2018	DRAWING NO. E.2.1
CHECKED BY B. BARGER	SCALE AS NOTED	

**BUREAU OF LABOR LAW COMPLIANCE  
PREVAILING WAGES PROJECT RATES**

Project Name:	42160105, Lock Haven FMS, HVAC and Exhaust Replacement
Awarding Agency:	Department of Military and Veterans Affairs
Contract Award Date:	9/30/2018
Serial Number:	18-05111
Project Classification:	Building
Determination Date:	7/5/2018
Assigned Field Office:	Altoona
Field Office Phone Number:	(814)940-6224
Toll Free Phone Number:	
Project County:	Clinton County

**BUREAU OF LABOR LAW COMPLIANCE  
PREVAILING WAGES PROJECT RATES**

<b>Project: 18-05111 - Building</b>	<b>Effective Date</b>	<b>Expiration Date</b>	<b>Hourly Rate</b>	<b>Fringe Benefits</b>	<b>Total</b>
Asbestos & Insulation Workers	7/1/2018		\$34.83	\$19.17	\$54.00
Asbestos & Insulation Workers	7/1/2019		\$34.48	\$20.52	\$55.00
Asbestos & Insulation Workers	7/1/2018		\$34.83	\$19.17	\$54.00
Asbestos & Insulation Workers	7/1/2016		\$34.48	\$18.52	\$53.00
Asbestos & Insulation Workers	7/1/2018		\$34.48	\$19.52	\$54.00
Boilermaker (Commercial, Institutional, and Minor Repair Work)	3/1/2018		\$29.52	\$18.22	\$47.74
Boilermaker (Commercial, Institutional, and Minor Repair Work)	3/1/2017		\$28.52	\$18.22	\$46.74
Boilermakers	3/1/2018		\$45.89	\$33.73	\$79.62
Bricklayers, Stone Masons, Pointers, Caulkers, Cleaners	5/1/2020		\$34.17	\$17.64	\$51.81
Bricklayers, Stone Masons, Pointers, Caulkers, Cleaners	5/1/2021		\$34.78	\$18.13	\$52.91
Bricklayers, Stone Masons, Pointers, Caulkers, Cleaners	5/1/2019		\$33.63	\$17.18	\$50.81
Bricklayers, Stone Masons, Pointers, Caulkers, Cleaners	5/1/2017		\$32.77	\$16.34	\$49.11
Bricklayers, Stone Masons, Pointers, Caulkers, Cleaners	5/1/2018		\$33.16	\$16.75	\$49.91
Carpenters	6/1/2017		\$27.93	\$14.79	\$42.72
Carpenters, Drywall Hangers, Framers, Instrument Men, Lathers, Soft Floor Layers	6/1/2018		\$28.51	\$15.27	\$43.78
Carpenters, Drywall Hangers, Framers, Instrument Men, Lathers, Soft Floor Layers	6/1/2021		\$30.77	\$16.89	\$47.66
Carpenters, Drywall Hangers, Framers, Instrument Men, Lathers, Soft Floor Layers	6/1/2020		\$29.93	\$16.39	\$46.32
Carpenters, Drywall Hangers, Framers, Instrument Men, Lathers, Soft Floor Layers	6/1/2019		\$29.11	\$15.92	\$45.03
Cement Masons	7/1/2019		\$28.49	\$17.45	\$45.94
Cement Masons	7/10/2017		\$26.96	\$16.73	\$43.69
Cement Masons	6/1/2018		\$27.25	\$10.71	\$37.96
Cement Masons	7/1/2018		\$27.74	\$17.10	\$44.84
Drywall Finisher	5/1/2017		\$27.81	\$18.17	\$45.98
Electricians	6/1/2018		\$34.24	\$19.45	\$53.69
Electricians	6/1/2017		\$33.59	\$18.88	\$52.47
Elevator Constructor	1/1/2018		\$45.35	\$33.00	\$78.35
Glazier	5/1/2016		\$29.02	\$15.51	\$44.53
Iron Workers	6/1/2018		\$28.97	\$29.07	\$58.04
Iron Workers (Bridge, Structural Steel, Ornamental, Precast, Reinforcing)	6/1/2017		\$28.02	\$28.36	\$56.38
Laborers (Class 01 - See notes)	1/1/2018		\$20.37	\$14.59	\$34.96
Laborers (Class 01 - See notes)	1/1/2018		\$18.47	\$16.49	\$34.96
Laborers (Class 02 - See notes)	1/1/2018		\$20.52	\$14.59	\$35.11
Laborers (Class 02 - See notes)	1/1/2018		\$18.62	\$16.49	\$35.11
Laborers (Class 03 - See notes)	1/1/2018		\$20.62	\$14.59	\$35.21
Laborers (Class 03 - See notes)	1/1/2018		\$18.72	\$16.49	\$35.21
Laborers (Class 04 - See notes)	1/1/2018		\$17.47	\$16.49	\$33.96

**BUREAU OF LABOR LAW COMPLIANCE  
PREVAILING WAGES PROJECT RATES**

<b>Project: 18-05111 - Building</b>	<b>Effective Date</b>	<b>Expiration Date</b>	<b>Hourly Rate</b>	<b>Fringe Benefits</b>	<b>Total</b>
Laborers (Class 04 - See notes)	1/1/2018		\$19.37	\$14.59	\$33.96
Landscape Laborer	1/1/2018		\$20.59	\$15.31	\$35.90
Landscape Laborer (Skilled)	1/1/2018		\$21.01	\$15.31	\$36.32
Landscape Laborer (Tractor Operator)	1/1/2018		\$21.31	\$15.31	\$36.62
Marble Mason	5/1/2021		\$31.55	\$17.34	\$48.89
Marble Mason	5/1/2019		\$30.46	\$16.43	\$46.89
Marble Mason	5/1/2018		\$29.88	\$16.01	\$45.89
Marble Mason	5/1/2020		\$31.02	\$16.87	\$47.89
Millwright	6/1/2017		\$39.83	\$18.57	\$58.40
Operators (Class 01 - see notes)	7/1/2018		\$30.72	\$18.12	\$48.84
Operators (Class 01 - see notes)	7/1/2021		\$32.47	\$20.32	\$52.79
Operators (Class 01 - see notes)	7/1/2019		\$31.27	\$18.82	\$50.09
Operators (Class 01 - see notes)	7/1/2020		\$31.87	\$19.57	\$51.44
Operators (Class 01 - see notes)	7/1/2017		\$30.17	\$17.42	\$47.59
Operators (Class 02 -see notes)	7/1/2020		\$27.45	\$19.57	\$47.02
Operators (Class 02 -see notes)	7/1/2021		\$27.85	\$20.32	\$48.17
Operators (Class 02 -see notes)	7/1/2017		\$26.45	\$17.42	\$43.87
Operators (Class 02 -see notes)	7/1/2018		\$26.75	\$18.12	\$44.87
Operators (Class 02 -see notes)	7/1/2019		\$27.05	\$18.82	\$45.87
Operators (Class 03 - See notes)	7/1/2018		\$25.50	\$18.12	\$43.62
Operators (Class 03 - See notes)	7/1/2017		\$25.30	\$17.42	\$42.72
Operators (Class 03 - See notes)	7/1/2021		\$26.30	\$20.32	\$46.62
Operators (Class 03 - See notes)	7/1/2020		\$26.00	\$19.57	\$45.57
Operators (Class 03 - See notes)	7/1/2019		\$25.70	\$18.82	\$44.52
Operators (Class 04 - Chief of Party (Surveying and Layout))	7/1/2016		\$23.65	\$16.77	\$40.42
Operators (Class 04 - Instrument Person (Surveying & Layout))	7/1/2016		\$22.65	\$16.77	\$39.42
Operators (Class 04 - Rodman/Chainman (Surveying and Layout))	7/1/2016		\$22.20	\$16.77	\$38.97
Painters Class 1 (see notes)	5/1/2017		\$27.25	\$18.17	\$45.42
Painters Class 2 (see notes)	5/1/2017		\$30.15	\$18.17	\$48.32
Painters Class 3 (see notes)	5/1/2017		\$36.25	\$18.17	\$54.42
Pile Driver Divers (Building, Heavy, Highway)	1/1/2018		\$50.33	\$18.55	\$68.88
Pile Driver Divers (Building, Heavy, Highway)	1/1/2019		\$51.45	\$19.30	\$70.75
Piledrivers	1/1/2019		\$34.30	\$19.30	\$53.60
Piledrivers	1/1/2018		\$33.55	\$18.55	\$52.10
Plasterers	6/1/2017		\$27.30	\$9.66	\$36.96
Plasterers	6/1/2017		\$27.30	\$9.66	\$36.96
Plumber/Pipefitter	5/1/2017		\$35.82	\$24.51	\$60.33
Plumber/Pipefitter	5/1/2018	4/30/2019	\$36.87	\$25.26	\$62.13
Roofers	6/1/2017		\$27.50	\$19.08	\$46.58
Sheet Metal Workers	5/1/2018	4/30/2019	\$30.63	\$23.73	\$54.36
Sheet Metal Workers	5/1/2017		\$30.61	\$22.95	\$53.56
Sprinklerfitters	4/1/2018		\$38.80	\$22.74	\$61.54



**BUREAU OF LABOR LAW COMPLIANCE  
PREVAILING WAGES PROJECT RATES**

<b>Project: 18-05111 - Building</b>	<b>Effective Date</b>	<b>Expiration Date</b>	<b>Hourly Rate</b>	<b>Fringe Benefits</b>	<b>Total</b>
Sprinklerfitters	4/1/2017		\$37.40	\$21.74	\$59.14
Terrazzo Finisher	5/1/2018		\$32.35	\$15.91	\$48.26
Terrazzo Finisher	5/1/2017		\$31.64	\$15.62	\$47.26
Terrazzo Finisher	5/1/2019		\$33.04	\$16.22	\$49.26
Terrazzo Setter	5/1/2017		\$30.63	\$18.85	\$49.48
Terrazzo Setter	5/1/2019		\$31.81	\$19.67	\$51.48
Terrazzo Setter	5/1/2018		\$31.23	\$19.25	\$50.48
Terrazzo Setter	5/1/2016		\$30.00	\$18.48	\$48.48
Tile & Marble Finisher	5/1/2021		\$29.61	\$15.14	\$44.75
Tile & Marble Finisher	5/1/2020		\$28.96	\$14.79	\$43.75
Tile & Marble Finisher	5/1/2018		\$27.60	\$14.15	\$41.75
Tile & Marble Finisher	5/1/2019		\$28.29	\$14.46	\$42.75
Tile & Marble Finisher	5/1/2017		\$26.89	\$13.86	\$40.75
Tile Setter	5/1/2021		\$31.55	\$17.34	\$48.89
Tile Setter	5/1/2020		\$31.02	\$16.87	\$47.89
Tile Setter	5/1/2019		\$30.46	\$16.43	\$46.89
Tile Setter	5/1/2018		\$29.88	\$16.01	\$45.89
Tile Setter	5/1/2017		\$29.27	\$15.62	\$44.89
Truckdriver class 1(see notes)	1/1/2016		\$27.44	\$16.51	\$43.95
Truckdriver class 2 (see notes)	1/1/2016		\$27.61	\$16.61	\$44.22
Truckdriver class 3 (see notes)	1/1/2016		\$28.10	\$16.88	\$44.98

**BUREAU OF LABOR LAW COMPLIANCE  
PREVAILING WAGES PROJECT RATES**

<b>Project: 18-05111 - Heavy/Highway</b>	<b>Effective Date</b>	<b>Expiration Date</b>	<b>Hourly Rate</b>	<b>Fringe Benefits</b>	<b>Total</b>
Carpenter Welder	1/1/2017		\$33.10	\$17.14	\$50.24
Carpenter Welder	1/1/2018		\$33.87	\$17.77	\$51.64
Carpenter Welder	1/1/2019		\$34.72	\$18.42	\$53.14
Carpenters	1/1/2018		\$32.92	\$17.77	\$50.69
Carpenters	1/1/2017		\$32.15	\$17.14	\$49.29
Carpenters	1/1/2019		\$33.77	\$18.42	\$52.19
Cement Finishers	1/1/2019		\$31.94	\$20.50	\$52.44
Cement Finishers	1/1/2018		\$31.04	\$19.90	\$50.94
Cement Finishers	1/1/2017		\$30.14	\$19.40	\$49.54
Electric Lineman	1/1/2018		\$55.43	\$22.48	\$77.91
Iron Workers (Bridge, Structural Steel, Ornamental, Precast, Reinforcing)	6/1/2017		\$28.02	\$28.36	\$56.38
Iron Workers (Bridge, Structural Steel, Ornamental, Precast, Reinforcing)	6/1/2016		\$27.81	\$27.25	\$55.06
Laborers (Class 01 - See notes)	1/1/2019		\$24.75	\$23.85	\$48.60
Laborers (Class 01 - See notes)	1/1/2018		\$24.75	\$22.35	\$47.10
Laborers (Class 01 - See notes)	1/1/2017		\$24.75	\$20.95	\$45.70
Laborers (Class 02 - See notes)	1/1/2018		\$24.91	\$22.35	\$47.26
Laborers (Class 02 - See notes)	1/1/2017		\$24.91	\$20.95	\$45.86
Laborers (Class 02 - See notes)	1/1/2019		\$24.91	\$23.85	\$48.76
Laborers (Class 03 - See notes)	1/1/2019		\$25.40	\$23.85	\$49.25
Laborers (Class 03 - See notes)	1/1/2018		\$25.40	\$22.35	\$47.75
Laborers (Class 03 - See notes)	1/1/2017		\$25.40	\$20.95	\$46.35
Laborers (Class 04 - See notes)	1/1/2019		\$25.85	\$23.85	\$49.70
Laborers (Class 04 - See notes)	1/1/2017		\$25.85	\$20.95	\$46.80
Laborers (Class 04 - See notes)	1/1/2018		\$25.85	\$22.35	\$48.20
Laborers (Class 05 - See notes)	1/1/2017		\$26.26	\$20.95	\$47.21
Laborers (Class 05 - See notes)	1/1/2018		\$26.26	\$22.35	\$48.61
Laborers (Class 05 - See notes)	1/1/2019		\$26.26	\$23.85	\$50.11
Laborers (Class 06 - See notes)	1/1/2017		\$23.10	\$20.95	\$44.05
Laborers (Class 06 - See notes)	1/1/2018		\$23.10	\$22.35	\$45.45
Laborers (Class 06 - See notes)	1/1/2019		\$23.10	\$23.85	\$46.95
Laborers (Class 07 - See notes)	1/1/2019		\$25.75	\$23.85	\$49.60
Laborers (Class 07 - See notes)	1/1/2018		\$25.75	\$22.35	\$48.10
Laborers (Class 07 - See notes)	1/1/2017		\$25.75	\$20.95	\$46.70
Laborers (Class 08 - See notes)	1/1/2018		\$27.25	\$22.35	\$49.60
Laborers (Class 08 - See notes)	1/1/2019		\$27.25	\$23.85	\$51.10
Laborers (Class 08 - See notes)	1/1/2017		\$27.25	\$20.95	\$48.20
Operators (Class 01 - see notes)	1/1/2018		\$31.00	\$20.78	\$51.78
Operators (Class 01 - see notes)	1/1/2019		\$31.60	\$21.68	\$53.28
Operators (Class 01 - see notes)	1/1/2017		\$30.40	\$19.98	\$50.38
Operators (Class 02 -see notes)	1/1/2019		\$31.32	\$21.68	\$53.00
Operators (Class 02 -see notes)	1/1/2017		\$30.12	\$19.98	\$50.10
Operators (Class 02 -see notes)	1/1/2018		\$30.72	\$20.78	\$51.50
Operators (Class 03 - See notes)	1/1/2017		\$26.48	\$19.98	\$46.46

**BUREAU OF LABOR LAW COMPLIANCE  
PREVAILING WAGES PROJECT RATES**

<b>Project: 18-05111 - Heavy/Highway</b>	<b>Effective Date</b>	<b>Expiration Date</b>	<b>Hourly Rate</b>	<b>Fringe Benefits</b>	<b>Total</b>
Operators (Class 03 - See notes)	1/1/2019		\$27.68	\$21.68	\$49.36
Operators (Class 03 - See notes)	1/1/2018		\$27.08	\$20.78	\$47.86
Operators (Class 04 - See notes)	1/1/2017		\$25.99	\$19.98	\$45.97
Operators (Class 04 - See notes)	1/1/2019		\$27.19	\$21.68	\$48.87
Operators (Class 04 - See notes)	1/1/2018		\$26.59	\$20.78	\$47.37
Operators (Class 05 - See notes)	1/1/2017		\$25.78	\$19.98	\$45.76
Operators (Class 05 - See notes)	1/1/2018		\$26.38	\$20.78	\$47.16
Operators (Class 05 - See notes)	1/1/2019		\$26.98	\$21.68	\$48.66
Pile Driver Divers (Building, Heavy, Highway)	1/1/2017		\$49.13	\$17.95	\$67.08
Pile Driver Divers (Building, Heavy, Highway)	1/1/2018		\$50.33	\$18.55	\$68.88
Pile Driver Divers (Building, Heavy, Highway)	1/1/2019		\$51.45	\$19.30	\$70.75
Piledrivers	1/1/2017		\$32.75	\$17.95	\$50.70
Piledrivers	1/1/2018		\$33.55	\$18.55	\$52.10
Piledrivers	1/1/2019		\$34.30	\$19.30	\$53.60
Steamfitters (Heavy and Highway - Gas Distribution)	5/1/2017		\$40.98	\$32.53	\$73.51
Truckdriver class 1(see notes)	1/1/2019		\$28.83	\$19.32	\$48.15
Truckdriver class 1(see notes)	1/1/2017		\$27.93	\$17.32	\$45.25
Truckdriver class 1(see notes)	1/1/2018		\$28.36	\$18.29	\$46.65
Truckdriver class 2 (see notes)	1/1/2019		\$28.99	\$19.43	\$48.42
Truckdriver class 2 (see notes)	1/1/2017		\$28.10	\$17.42	\$45.52
Truckdriver class 2 (see notes)	1/1/2018		\$28.52	\$18.40	\$46.92
Truckdriver class 3 (see notes)	1/1/2019		\$29.45	\$19.73	\$49.18
Truckdriver class 3 (see notes)	1/1/2018		\$28.98	\$18.70	\$47.68
Truckdriver class 3 (see notes)	1/1/2017		\$28.57	\$17.71	\$46.28



June 12, 2018

Ms. Tina Rebuck  
Department of Military & Veterans Affairs  
Procurement Contracting  
Building 0-47, Fort Indiantown Gap  
Annville, PA 17003

Re: DMVA Project No.: 42160105 – HVAC & Exhaust Replacement Lock Haven FMS  
Request for Proprietary Specifications – Automated Logic Controls

Dear Ms. Rebuck,

DMVA/PaARNG request that only Automated Logic Controls be utilized for the above referenced project. We have Automated Logic Controls installed in the majority of our facilities throughout the state. This is a tremendous opportunity to implement a Master Control Plan which would encompass approximately 70 of our facilities about 80% in all.

The benefits of having a Master Control Plan are numerous and will have a tremendous cost savings in O&M cost. Benefits include:

1. Consistent look and feel of all control systems for our Facility Managers.
2. Consistent HVAC sequencing in all the facilities.
3. Consistent scheduling, data trending, alarming and remote access capabilities.
4. System performance standards.
5. Commissioning and re-commissioning standards.
6. Reduced training time for Facility Managers and operators.
7. Guaranteed compatibility for all systems
8. Sole Source responsibility for entire system.

Automated Logic Controls has been selected as our vendor because of the simplicity of their system. It is completely designed around open standards. It uses the language of the World Wide Web (HTTP) to communicate over the Internet without special software. It is capable of monitoring and controlling a wide variety of third party HVAC and electrical equipment through a browser. Finally, it is compatible with many other ATC systems that we may have in place at this time.

For this project, the value of the proposed devices/systems is approximately \$40,000, which is approximately 18% of the \$220,000 HVAC construction contract cost estimate, and approximately 8% of the \$500,000 total project's construction cost estimate.

For this project, the value of the non-proprietary devices/systems is approximately \$50,000, which is approximately 23% of the \$220,000 HVAC construction contract cost estimate, and approximately 10% of the \$500,000 total project's construction cost estimate.

I look forward to a favorable response regarding this issue as soon as possible.

A handwritten signature in blue ink, appearing to read "Michael R. Allegretto".

Michael R. Allegretto, E.I.T.  
Mechanical Engineer II  
Bureau of Military Construction & Engineering

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## **PART I - GENERAL INFORMATION**

### **PART I - GENERAL INFORMATION**

#### **I.1 IFB-001.1 Purpose (Oct 2006)**

The Commonwealth of Pennsylvania (Commonwealth) is issuing this Invitation for Bids (IFB) to meet the needs of DEPARTMENT OF MILITARY AND VETERANS AFFAIRS to satisfy a need for HVAC & Exhaust Replacement.

#### **I.2 IFB-005.1 Type of Contract (Oct. 2006)**

If the Issuing Office enters into a contract as a result of this IFB, it will be a contract containing the Contract Terms and Conditions as shown in Part V of this IFB.

#### **I.3 IFB-008.1B Mandatory Pre-bid Conference (Oct. 2006)**

The Issuing Office will hold a pre-bid conference. The purpose of this conference is to provide opportunity for clarification of the IFB. Bidders should forward all questions before the pre-bid conference. Bidders may also ask questions at the conference. In view of the limited facilities available for the conference, Bidders should limit their representation to two individuals per Bidder. The pre-bid conference is for information only. Any answers furnished during the conference will not be official until they have been verified, in writing, by the Issuing Office. **Failure to attend the pre-bid conference shall disqualify a Bidder from consideration for the contract to be awarded from this IFB, and its bid will be returned unopened.** The pre-bid conference will be held on 07/17/2018 at LOCK HAVEN FMS, 66 ARMORY ROAD, LOCK HAVEN, PA. 17745 AT 9:00AM .

#### **I.4 IFB-008.2 Mandatory Site Visitation (Oct. 2006)**

All bidders, prior to submitting a bid, must visit the site to completely familiarize themselves with all of the agency's needs and requirements. Vendor shall contact TINA REBUCK at 717-861-8794 to schedule an appointment to visit the site.

#### **I.5 IFB-009.1 Questions (February 2012)**

All questions regarding the IFB must be submitted in writing to the email address of the Issuing Officer provided in the solicitation. While there is no set timeline for the submittal of questions, questions received within 48 hours prior to the bid due date and time will be answered at the discretion of the Commonwealth. All questions received will be answered, in writing, and such responses shall be posted to eMarketplace as an addendum to the IFB. The Issuing Officer shall not be bound by any verbal information nor shall it be bound by any written information that is not either contained within the IFB or formally issued as an addendum by the Issuing Office. The Issuing Office does not consider questions to be a protest of the specifications or of the solicitation.

#### **I.6 IFB-010.1 Addenda to the IFB (Oct. 2006)**

If the Issuing Office deems it necessary to revise any part of this IFB before the bid response date, the Issuing Office will post an addendum to its website at [WWW.DMVA.PA.GOV](http://WWW.DMVA.PA.GOV) it is the Bidder's responsibility to periodically check the website for any new information or addenda to the IFB.

#### **I.7 IFB-011.1A Submission of Bids – Paper Submittal (Dec 12 2006)**

a. Bids are requested for the item(s) described in the Invitation For Bids and all the documents referenced in the



form (collectively called the IFB). Bidders must complete and properly sign, in ink, the Invitation For Bids form. Bid prices must be typewritten or in ink. Bids that are priced or signed in pencil will be rejected.

- b. The completed and signed Invitation For Bids form, as well as the other documents required by the IFB (collectively referred to as the "Bid"), shall be enclosed and sealed in an envelope which is clearly marked "Bid" and includes the assigned Bid Invitation Number (Shown on the Invitation For Bids form) and the Bidder's vendor number as well as the bid opening date and time. It is the responsibility of each bidder to ensure that its Bid is received at the return address shown on the Invitation For Bids form ("Bid Opening Room") prior to the date and time set for the opening of bids ("Bid Opening Time"), regardless of method of delivery used. No Bid shall be considered if it arrives at the Bid Opening Room after the Bid Opening Time, regardless of reason for the late arrival. In the event that, due to inclement weather, natural disaster, or other cause, the Commonwealth offices are officially closed on the date scheduled for Bid opening, the Bid Opening date shall be automatically postponed until the next Commonwealth business day, unless the Bidders are otherwise notified by the Issuing Office. The Bid Opening time shall remain the same.

All envelopes containing Bids should be clearly marked "Bid" and should include the address of the Bid Opening Room (not the agency central processing location), the assigned Collective Number and the Bid Opening Time. Bids that are timely received in the Bid Opening Room prior to the Bid Opening Time shall be opened publicly in the presence of one or more witnesses at the time and place designated in this IFB for the Bid opening.

- c. Bids must be firm. If a Bid is submitted with conditions or exceptions or not in conformance with the terms and conditions referenced in the IFB Form, it shall be rejected. The Bid shall also be rejected if the items offered by the Bidder are not in conformance with the specifications as determined by the Commonwealth.
- d. The Bidder, intending to be legally bound hereby, offers and agrees, if this Bid is accepted, to provide the awarded items at the price(s) set forth in this Bid at the time(s) and place(s) specified.

#### **I.8 IFB-024.1 Bid Protest Procedure (April 2016)**

The Bid Protest Procedure is on the DGS website at <http://www.dgs.pa.gov/Documents/Procurement%20Forms/Handbook/Pt1/Pt%20I%20Ch%2058%20Bid%20Protests.pdf>

#### **I.9 IFB-029.1 Prices (Dec 6 2006)**

The bid submitted by the successful Bidder will be incorporated into any resulting Contract and the Bidder will be required to provide the awarded item(s) at the prices quoted in its Bid.

#### **I.10 IFB-030.1 Approved Equal (Nov 2006)**

Whenever an item is defined in this IFB by trade name and catalogue number of a manufacturer or vendor, the term 'or approved equal,' if not inserted therewith shall be implied. Any reference to a particular manufacturer's product either by trade name or by limited description is solely for the purpose of more clearly indicating the minimum standard of quality desired, except where a 'no substitute' is requested. When a 'no substitute' is requested, the Issuing Office will consider Bids for the referenced product only. The term 'or approved equal' is defined as meaning any other make which, in the sole opinion of the Issuing Office, is of such character, quality, and performance equivalence as to meet the standard of quality of products specified for which it is to be used equally as well as that specified. A Bidder quoting on a product other than the referenced product shall: a) furnish complete identification in its Bid of the product it is offering by trade name, brand and/or model number; b) furnish descriptive literature and data with respect to the substitute product it proposes to furnish; and c) indicate any known specification deviations from the referenced product.

#### **I.11 IFB-031.1 Alternates (Oct 2013)**

A Bidder who wants to offer an alternate must notify the Issuing Office in writing, at least five (5) days prior to the scheduled Bid opening, that the Bidder intends to offer an alternate in its Bid. An "alternate" is a product that deviates from the requirements of the specifications in its composition, qualities, performance, size dimension, etc. The written notification from the Bidder must include a complete description of the alternate and must identify the product's deviations from the specifications. Upon receipt of the notification, the Issuing Office will determine whether the alternate is acceptable. If the Issuing Office, in its discretion, determines that the alternate is acceptable, the Issuing Office will issue a change notice to the invitation for bids that revises the specifications. If no change notice is issued revising the specification, a Bid offering the alternate will not be considered for award. If an item or items in the IFB are designated "no substitute," this provision does not apply and no alternate may be proposed by a bidder nor will any alternate be considered by the Issuing Office.

#### **I.12 IFB-032.1 New Equipment (Nov 2006)**

Unless otherwise specified in this invitation for bids, all products offered by Bidders must be new or remanufactured. A 'new' product is one that will be used first by the Commonwealth after it is manufactured or produced. A 'remanufactured' product is one which: 1) has been rebuilt, using new or used parts, to a condition which meets the original manufacturer's most recent specifications for the item; 2) does not, in the opinion of the Issuing Office, differ in appearance from a new item; and 3) has the same warranty as a new item. Unless otherwise specified in this invitation for bids, used or reconditioned products are not acceptable. This clause shall not be construed to prohibit Bidders from offering products with recycled content, provided the product is new or remanufactured.

#### **I.13 I-IFB-033.1 Modification or Withdrawal of Bid (Nov 2006)**

- a. Bid Modification Prior to Bid Opening. Bids may be modified only by written notice or in person prior to the exact hour and date specified for Bid opening.
  - 1) If a Bidder intends to modify its Bid by written notice, the notice must specifically identify the Bid to be modified and must be signed by the Bidder. The Bidder must include evidence of authorization for the individual who signed the modification to modify the Bid on behalf of the Bidder. The Bid modification must be received in a sealed envelope. The sealed envelope must identify the assigned Collective Number and the Bid Opening Time, and should state that enclosed in the envelope is a Bid modification
  - 2) If a Bidder intends to modify its Bid in person, the individual who will modify the Bid must arrive in the Bid Opening Room prior to the Bid Opening Time, show a picture identification and provide evidence of his/her authorization to modify the Bid on behalf of the Bidder. If a Bidder intends to modify its Bid in person, the Bidder may do so only in the presence of an agency employee. (The agency employee will observe the actions taken by the individual to modify the Bid, but will not read the Bid or the modification).
- b. Bid Withdrawal Prior to Bid Opening. Bids may be withdrawn only by written notice or in person prior to the exact hour and date specified for Bid opening.
  - 1) If a Bidder intends to withdraw its Bid by written notice, the notice shall specifically identify the Bid to be withdrawn and shall be signed by the Bidder. The Bidder must include evidence of authorization for the individual who signed the bid withdrawal to withdraw the bid on behalf of the Bidder. Except as provided in Subparagraph c, below, bid withdrawals received after the exact hour and date specified for the receipt of Bids shall not be accepted.
  - 2) If a Bidder intends to withdraw its Bid in person, the individual who will withdraw the Bid must arrive in the Bid Opening Room prior to the Bid Opening Time, show a picture identification and provide evidence of his/her authorization to withdraw the Bid on behalf of the Bidder.
- c. Bid Withdrawal After Bid Opening. Bidders are permitted to withdraw erroneous Bids after Bid opening only if the following conditions are met:
  - 1) The Bidder submits a written request for withdrawal.

- 2) The Bidder presents credible evidence with the request that the reason for the lower Bid price was a clerical mistake as opposed to a judgment mistake and was actually due to an unintentional arithmetical error or an unintentional omission of a substantial quantity of work, labor, material, or services made directly in the compilation of the Bid.
  - 3) The request for relief and supporting evidence must be received by the Issuing Office within three (3) business days after Bid opening, but before award of the contract.
  - 4) The Issuing Office shall not permit a Bid withdrawal if the Bid withdrawal would result in the award of the contract on another Bid of the same Bidder, its partner, or a corporation or business venture owned by or in which the bidder has a substantial interest.
  - 5) If a Bidder is permitted to withdraw its Bid, the Bidder cannot supply any material or labor or perform any subcontract or other work agreement for the awarded contractor, without the written approval of the Issuing Office.
- d. **Firm Bid.** Except as provided above, a Bid may not be modified, withdrawn, or cancelled by any Bidder for a period of sixty (60) days following the time and date designated for Bid opening, unless otherwise specified by the Bidder in its Bid. If the lowest responsible Bidder, as determined by the Issuing Office, withdraws its Bid prior to the expiration of the award period or fails to comply with the requirements set forth in the IFB including but not limited to any requirement to submit performance or payment bonds or insurance certificates within the required time period, the Bidder shall be liable to the Commonwealth for all costs and damages associated with the re-award or re-bid including the difference between the Bidder's price and the actual cost that the Commonwealth pays for the awarded items.
- e. **Clarification and Additional Information.** After the receipt of Bids, the Issuing Office shall have the right to contact Bidders for the purpose of seeking:
- 1) Clarification of the Bid which confirms the Issuing Office's understanding of statements or information in the Bid or;
  - 2) Additional information on the items offered; provided the IFB does not require the rejection of the Bid for failure to include such information.

#### **I.14 I-IFB-034.1 Rejection of Bids (Nov 2006)**

The Issuing Office reserves the right to reject any and all Bids, to waive technical defects or any informality in Bids, and to accept or reject any part of any Bid if the best interests of the Commonwealth are thereby served.

#### **I.15 Submission-001.1 Representations and Authorizations (February 2017)**

By submitting its proposal, each Offeror understands, represents, and acknowledges that:

- A. All of the Offeror's information and representations in the proposal are material and important, and the Issuing Office may rely upon the contents of the proposal in awarding the contract(s). The Commonwealth shall treat any misstatement, omission or misrepresentation as fraudulent concealment of the true facts relating to the Proposal submission, punishable pursuant to 18 Pa. C.S. § 4904.
- B. The Offeror has arrived at the price(s) and amounts in its proposal independently and without consultation, communication, or agreement with any other Offeror or potential offeror.
- C. The Offeror has not disclosed the price(s), the amount of the proposal, nor the approximate price(s) or amount(s) of its proposal to any other firm or person who is an Offeror or potential offeror for this RFP, and the Offeror shall not disclose any of these items on or before the proposal submission deadline specified in the Calendar of Events of this RFP.

D. The Offeror has not attempted, nor will it attempt, to induce any firm or person to refrain from submitting a proposal on this contract, or to submit a proposal higher than this proposal, or to submit any intentionally high or noncompetitive proposal or other form of complementary proposal.

E. The Offeror makes its proposal in good faith and not pursuant to any agreement or discussion with, or inducement from, any firm or person to submit a complementary or other noncompetitive proposal.

F. To the best knowledge of the person signing the proposal for the Offeror, the Offeror, its affiliates, subsidiaries, officers, directors, and employees are not currently under investigation by any governmental agency and have not in the last four years been convicted or found liable for any act prohibited by State or Federal law in any jurisdiction, involving conspiracy or collusion with respect to bidding or proposing on any public contract, except as the Offeror has disclosed in its proposal.

G. To the best of the knowledge of the person signing the proposal for the Offeror and except as the Offeror has otherwise disclosed in its proposal, the Offeror has no outstanding, delinquent obligations to the Commonwealth including, but not limited to, any state tax liability not being contested on appeal or other obligation of the Offeror that is owed to the Commonwealth.

H. The Offeror is not currently under suspension or debarment by the Commonwealth, any other state or the federal government, and if the Offeror cannot so certify, then it shall submit along with its proposal a written explanation of why it cannot make such certification.

I. The Offeror has not made, under separate contract with the Issuing Office, any recommendations to the Issuing Office concerning the need for the services described in its proposal or the specifications for the services described in the proposal.

J. Each Offeror, by submitting its proposal, authorizes Commonwealth agencies to release to the Commonwealth information concerning the Offeror's Pennsylvania taxes, unemployment compensation and workers' compensation liabilities.

K. Until the selected Offeror receives a fully executed and approved written contract from the Issuing Office, there is no legal and valid contract, in law or in equity, and the Offeror shall not begin to perform.

L. The Offeror is not currently engaged, and will not during the duration of the contract engage, in a boycott of a person or an entity based in or doing business with a jurisdiction which the Commonwealth is not prohibited by Congressional statute from engaging in trade or commerce.

## **PART II - REQUIREMENTS**

### **PART II - REQUIREMENTS**

#### **II.1 II-IFB-008.1a Lobbying Certification and Disclosure – Paper Submission. (Oct 2006).**

With respect to an award of a federal contract, grant, or cooperative agreement exceeding \$100,000 or an award of a federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding \$150,000 all recipients must certify that they will not use federal funds for lobbying and must disclose the use of non-federal funds for lobbying by filing required documentation. Offerors must complete and return the Lobbying Certification Form and the Disclosure of Lobbying Activities Form, which are attached to and made a part of this IFB. The completed and signed Lobbying Certification Form and the Disclosure of Lobbying Activities Form should be submitted in the same sealed envelope with the Bid Response. Commonwealth agencies will not contract with outside firms or individuals to perform lobbying services, regardless of the source of funds.

#### **II.2 II-IFB-014.1a Bid Security (Oct 2013)**

All bidders must submit, with their bids, bid security in the amount of 10.00 % of the total contract cost. Bid security received after bid opening time and date shall cause the bid to be rejected. Bid security must be in the form of a bid bond, a specific performance bond, an irrevocable letter of credit or a certificate of deposit, all in a form acceptable to the Commonwealth, or a certified check or bank cashier's check drawn to the order of the "Commonwealth of Pennsylvania". All bid security must be conditioned for acceptance of award or faithful performance of the terms of the contract or purchase order if awarded. In lieu of one of the forms of bid security listed above, bidders may file and are encouraged to file with the Department of General Services an annual bid and performance bond, which must be in the minimum amount of \$10,000 and in sufficient amount to cover all bids which may be submitted by the bidder during a calendar year period. No other forms of bid security shall be acceptable.

If a bid bond is used, the bidder must, within ten (10 days after notification, replace the bid bond with performance security in the form of a specific performance bond, an irrevocable letter of credit, a certificate of deposit, an annual bid and performance bond, all in a form acceptable to the Commonwealth or a certified check or a bank cashier's check. Failure to replace a bid bond within this time frame may result in award to another bidder, and the bidder, who did not replace the bid bond, shall be responsible for any increase in cost.

Where the bidder does not comply with the bid, contract, or purchase order(s) the amount of the Commonwealth's damages shall be liquidated to the amount of the proceeds of the check, performance bond, letter of credit, certificate of deposit, or escrow account or the Commonwealth may, at its option, sue the bidder or its surety for the damages it has suffered for any breach of contract in which case security held by the Commonwealth shall be applied as a credit in such suit for damages. Checks deposited with the Commonwealth as a prerequisite to competitive bidding shall be placed in authorized state depositories by the Treasury Department as required by the Fiscal Code 72 P.S. Section 301. Checks shall be returned to those bidders whose bid is not accepted and to the successful bidder upon completion of performance of the contract or purchase order(s). If an irrevocable letter of credit, certificate of deposit, escrow account is submitted, the document must require the financial institution to pay the Commonwealth, upon written notice, the amount demanded by the Commonwealth up to the amount of the irrevocable letter of credit, escrow account, or certificate of deposit.

#### **II.3 II-IFB-016.1 Post-Submission Descriptive Literature (Dec 2006)**

The Commonwealth may, during its evaluation of the bids, require any bidder to submit cuts, illustrations, drawings, prints, test data sheets, specification sheets and brochures which detail construction features, design, components, materials used, applicable dimensions and any other pertinent information which the Issuing Office may require in order to evaluate the product(s) offered. The required information must be submitted within two (2) business days after notification from the Issuing Office. Failure to submit the required information prior to the expiration of the second business day after notification shall result in the rejection of the bid as non-responsive.

#### **II.4 II-IFB-018.1a Iran Free Procurement Certification and Disclosure – Paper Submittal (November 2016)**

Prior to entering a contract worth at least \$1,000,000 or more with a Commonwealth entity, a bidder must: a) certify it is not on the current list of persons engaged in investment activities in Iran created by the Pennsylvania Department of General Services (“DGS”) pursuant to Section 3503 of the Procurement Code and is eligible to contract with the Commonwealth under Sections 3501-3506 of the Procurement Code; or b) demonstrate it has received an exception from the certification requirement for that solicitation or contract pursuant to Section 3503(e). All bidders must complete and return the Iran Free Procurement Certification form, which is attached hereto and made part of this IFB. The completed and signed Iran Free Procurement Certification form must be submitted in the same sealed envelope with the Bid Response.

See the following web page for current Iran Free Procurement list:

<http://www.dgs.pa.gov/businesses/materials%20and%20services%20procurement/procurement-resources/pages/default.aspx#.WDNfJ>

## **PART III - SELECTION CRITERIA**

### **PART III - SELECTION CRITERIA**

#### **III.1 III-IFB-001.1a Mandatory Responsiveness Requirements (Oct 2006)**

To be eligible for selection, a bid must be:

- a. Timely received from a Bidder;
- b. Properly signed by the Bidder.

#### **III.2 III-IFB-006.1b Method of Award - By Lot (February 2012)**

It is the intent of the Commonwealth to award by lots established in the IFB or in the pricing spreadsheets to the lowest responsive and responsible bidder per lot. The Commonwealth reserves the right to award by line item or to award all lots to a single vendor if it determines that it is in the best interest of the Commonwealth to do so.

#### **III.3 III-IFB-007.1 Awards (May 2011)**

Unless all Bids are rejected, and except as otherwise provided by law, award will be made through the issuance of a contract/purchase order in accordance with the method of award. Unless otherwise specified by the Issuing Office in the IFB form the Commonwealth reserves the right to award by item or on a total Bid basis, whichever is deemed more advantageous to the Commonwealth. In cases of discrepancies in prices, the unit price will be binding unless the unit price is obviously in error and the extended price is obviously correct, in which case the erroneous unit price will be corrected. As a condition for receipt of award of a contract/purchase order, the Bidder must be registered in the Commonwealth of Pennsylvania's Vendor Master file. In order to register, bidders must visit the Pa Supplier Portal at <https://www.pasupplierportal.state.pa.us/> or call the Customer Support Center at 877-435-7363 or 717-346-2676.

#### **III.4 III-IFB-008.1 Tie Bids (Nov 2006)**

All tie bids will be broken by the Issuing Office.

#### **III.5 III-IFB-009.1 Prompt Payment Discounts (Nov 2006)**

Prompt payment discounts will not be considered in making an award. If prompt payment discounts are offered by any Bidder, however, the Issuing Office will take advantage of such offer.

#### **III.6 III-IFB-010.1 Option for Separate Competitive Bidding Procedure (Nov 2006)**

The Commonwealth reserves the right to purchase products or services covered under this Contract through a separate competitive bidding procedure, whenever Commonwealth deems it in the best interest of the Commonwealth. The right will generally be exercised only when a specific need for a large quantity of the product or service exists or when the price offered is significantly lower than the Contract price.

**PART IV - WORK STATEMENT**

**PART IV - WORK STATEMENT**

**IV.1 IV-IFB-001.1c Specifications and Statement of Work – Construction (Nov 2006)**

The Commonwealth is seeking bids to procure the materials and services set forth in the attached document entitled "Specifications and Statement of Work."



## **PART V - CONTRACT TERMS and CONDITIONS**

### **PART V - CONTRACT TERMS and CONDITIONS**

#### **V.1 CONTRACT-001.1b Contract Terms and Conditions (Nov 30, 2006)**

The Contract with the awarded bidder (who shall become the "Contractor") shall include the following terms and conditions:

#### **V.2 CONTRACT-002.1b Term of Contract – PO (July 2015)**

The term of the Contract created by the issuance of the Purchase Order shall commence on the Original PO Effective Date printed on the Purchase Order after the Purchase Order has been fully executed by the Commonwealth (signed and approved as required by Commonwealth contracting procedures and sent to the Contractor). If the Purchase Order output form does not have "Fully Executed" at the top of the first page and does not have the name of the Purchasing Agent printed in the appropriate box, the Purchase Order has not been fully executed. Subject to the other provisions of the Contract, the Contract shall end on the later of: a) complete delivery and acceptance of the awarded item(s); b) the expiration of any specified warranty and maintenance period; c) payment by the Commonwealth for the item(s) received; or d) any Expiration Date identified in the Purchase Order.

#### **V.3 CONTRACT-002.3 Extension of Contract Term (Nov 30 2006)**

The Commonwealth reserves the right, upon notice to the Contractor, to extend any single term of the Contract for up to three (3) months upon the same terms and conditions.

#### **V.4 CONTRACT-003.1c Signatures - PO (July 2015)**

The Contract shall not be a legally binding contract until the fully-executed Purchase Order has been sent to the Contractor. No Commonwealth employee has the authority to verbally direct the commencement of any work or delivery of any supply under this Purchase Order prior to the Original PO Effective Date. The Contractor hereby waives any claim or cause of action for any service or work performed prior to the Original PO Effective Date.

The Purchase Order may be electronically signed by the Commonwealth. The electronically-printed name of the Purchasing Agent, or in the case of an Auto-Purchase Order the name of the Centralized Purchasing Group, represents the signature of that individual(s) who has the authority, on behalf of the Commonwealth, to bind the Commonwealth to the terms of the Contract. If the Purchase Order output form does not have "Fully Executed" at the top of the first page and does not have the name of the Purchasing Agent, or in the case of an Auto-Purchase Order the name of the Centralized Purchasing Group, printed in the appropriate box, the Contract has not been fully executed.

The fully-executed Purchase Order may be sent to the Contractor electronically or through facsimile equipment. The electronic transmission of a Purchase Order shall require acknowledgement of receipt of the transmission by the Contractor. Receipt of the electronic or facsimile transmission of the Purchase Order shall constitute receipt of the fully-executed Purchase Order.

The Commonwealth and the Contractor specifically agree as follows:

- a. No handwritten signature shall be required in order for the Purchase Order to be legally enforceable.
- b. The parties agree that no writing shall be required in order to make the Purchase Order legally binding, notwithstanding contrary requirements in any law. The parties hereby agree not to contest the validity or enforceability of a genuine Purchase Order or acknowledgement issued electronically under the provisions of a statute of frauds or any other applicable law relating to whether certain agreements be in writing and signed by the party bound thereby. Any genuine Purchase Order or acknowledgement issued electronically, if introduced as evidence on paper in any judicial, arbitration, mediation, or administrative proceedings, will be admissible as between the parties to the same extent and under the same conditions as other business records originated and maintained in documentary form. Neither party shall contest the admissibility of copies of a genuine Purchase Order

or acknowledgements under either the business records exception to the hearsay rule or the best evidence rule on the basis that the Purchase Order or acknowledgement were not in writing or signed by the parties. A Purchase Order or acknowledgment shall be deemed to be genuine for all purposes if it is transmitted to the location designated for such documents.

c. Each party will immediately take steps to verify any document that appears to be obviously garbled in transmission or improperly formatted to include re-transmission of any such document if necessary.

#### **V.5 CONTRACT-004.1a Definitions (Oct 2013)**

As used in this Contract, these words shall have the following meanings:

a. Agency: The department, board, commission or other agency of the Commonwealth of Pennsylvania listed as the Purchasing Agency. If a COSTARS entity or external procurement activity has issued an order against this contract, that entity shall also be identified as "Agency".

b. Contracting Officer: The person authorized to administer this Contract for the Commonwealth and to make written determinations with respect to the Contract.

c. Days: Unless specifically indicated otherwise, days mean calendar days.

d. Developed Works or Developed Materials: All documents, sketches, drawings, designs, works, papers, files, reports, computer programs, computer documentation, data, records, software, samples or any other tangible material without limitation authored or prepared by Contractor as the work product covered in the scope of work for the Project.

e. Documentation: All materials required to support and convey information about the services required by this Contract. It includes, but is not necessarily restricted to, written reports and analyses, diagrams, maps, logical and physical designs, system designs, computer programs, flow charts, disks, and/or other machine-readable storage media.

f. Services: All Contractor activity necessary to satisfy the Contract.

#### **V.6 CONTRACT-006.1 Independent Prime Contractor (Oct 2006)**

In performing its obligations under the Contract, the Contractor will act as an independent contractor and not as an employee or agent of the Commonwealth. The Contractor will be responsible for all services in this Contract whether or not Contractor provides them directly. Further, the Contractor is the sole point of contact with regard to all contractual matters, including payment of any and all charges resulting from the Contract.

#### **V.7 CONTRACT-008.1a Warranty. (Oct 2006)**

The Contractor warrants that all items furnished and all services performed by the Contractor, its agents and subcontractors shall be free and clear of any defects in workmanship or materials. Unless otherwise stated in the Contract, all items are warranted for a period of one year following delivery by the Contractor and acceptance by the Commonwealth. The Contractor shall repair, replace or otherwise correct any problem with the delivered item. When an item is replaced, it shall be replaced with an item of equivalent or superior quality without any additional cost to the Commonwealth.

#### **V.8 CONTRACT-009.1c Patent, Copyright, and Trademark Indemnity (Oct 2013)**

The Contractor warrants that it is the sole owner or author of, or has entered into a suitable legal agreement concerning either: a) the design of any product or process provided or used in the performance of the Contract which is covered by a patent, copyright, or trademark registration or other right duly authorized by state or federal law or b) any copyrighted matter in any report, document or other material provided to the Commonwealth under the contract.

The Contractor shall defend any suit or proceeding brought against the Commonwealth on account of any alleged

patent, copyright or trademark infringement in the United States of any of the products provided or used in the performance of the Contract.

This is upon condition that the Commonwealth shall provide prompt notification in writing of such suit or proceeding; full right, authorization and opportunity to conduct the defense thereof; and full information and all reasonable cooperation for the defense of same.

As principles of governmental or public law are involved, the Commonwealth may participate in or choose to conduct, in its sole discretion, the defense of any such action.

If information and assistance are furnished by the Commonwealth at the Contractor's written request, it shall be at the Contractor's expense, but the responsibility for such expense shall be only that within the Contractor's written authorization.

The Contractor shall indemnify and hold the Commonwealth harmless from all damages, costs, and expenses, including attorney's fees that the Contractor or the Commonwealth may pay or incur by reason of any infringement or violation of the rights occurring to any holder of copyright, trademark, or patent interests and rights in any products provided or used in the performance of the Contract.

If any of the products provided by the Contractor in such suit or proceeding are held to constitute infringement and the use is enjoined, the Contractor shall, at its own expense and at its option, either procure the right to continue use of such infringement products, replace them with non-infringement equal performance products or modify them so that they are no longer infringing.

If the Contractor is unable to do any of the preceding, the Contractor agrees to remove all the equipment or software which are obtained contemporaneously with the infringing product, or, at the option of the Commonwealth, only those items of equipment or software which are held to be infringing, and to pay the Commonwealth: 1) any amounts paid by the Commonwealth towards the purchase of the product, less straight line depreciation; 2) any license fee paid by the Commonwealth for the use of any software, less an amount for the period of usage; and 3) the pro rata portion of any maintenance fee representing the time remaining in any period of maintenance paid for. The obligations of the Contractor under this paragraph continue without time limit. No costs or expenses shall be incurred for the account of the Contractor without its written consent.

#### **V.9 CONTRACT-009.1d Ownership Rights (Oct 2006)**

The Commonwealth shall have unrestricted authority to reproduce, distribute, and use any submitted report, data, or material, and any software or modifications and any associated documentation that is designed or developed and delivered to the Commonwealth as part of the performance of the Contract.

#### **V.10 CONTRACT-010.2 Product Conformance (March 2012)**

The Commonwealth reserves the right to require any and all Contractors to:

1. Provide certified data from laboratory testing performed by the Contractor, or performed by an independent laboratory, as specified by the Commonwealth.
2. Supply published manufacturer product documentation.
3. Permit a Commonwealth representative to witness testing at the Contractor's location or at an independent laboratory.
4. Complete a survey/questionnaire relating to the bid requirements and specifications.
5. Provide customer references.
6. Provide a product demonstration at a location near Harrisburg or the using agency location.

#### **V.11 CONTRACT-010.3 Rejected Material Not Considered Abandoned (March 2012)**

The Commonwealth shall have the right to not regard any rejected material as abandoned and to demand that the Contractor remove the rejected material from the premises within thirty (30) days of notification. The Contractor shall be responsible for removal of the rejected material as well as proper clean-up. If the Contractor fails or refuses to remove the rejected material as demanded by the Commonwealth, the Commonwealth may seek payment from, or set-off from any payments due to the Contractor under this or any other Contract with the Commonwealth, the costs of removal and clean-up. This is in addition to all other rights to recover costs incurred by the Commonwealth.

#### **V.12 CONTRACT-011.1a Compliance With Law (Oct 2006)**

The Contractor shall comply with all applicable federal and state laws and regulations and local ordinances in the performance of the Contract.

#### **V.13 CONTRACT-013.1 Environmental Provisions (Oct 2006)**

In the performance of the Contract, the Contractor shall minimize pollution and shall strictly comply with all applicable environmental laws and regulations, including, but not limited to: the Clean Streams Law Act of June 22, 1937 (P.L. 1987, No. 394), as amended 35 P.S. Section 691.601 et seq.; the Pennsylvania Solid Waste Management Act, Act of July 7, 1980 (P.L. 380, No. 97), as amended, 35 P.S. Section 6018.101 et seq. ; and the Dam Safety and Encroachment Act, Act of November 26, 1978 (P.L. 1375, No. 325), as amended , 32 P.S. Section 693.1.

#### **V.14 CONTRACT-014.1 Post-Consumer Recycled Content (June 2016)**

Except as specifically waived by the Department of General Services in writing, any products which are provided to the Commonwealth as a part of the performance of the Contract must meet the minimum percentage levels for total recycled content as specified by the Environmental Protection Agency in its Comprehensive Procurement Guidelines, which can be found at <https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program> .

#### **V.15 CONTRACT-014.3 Recycled Content Enforcement (February 2012)**

The Contractor may be required, after delivery of the Contract item(s), to provide the Commonwealth with documentary evidence that the item(s) was in fact produced with the required minimum percentage of post-consumer and recovered material content.

#### **V.16 CONTRACT-016.2 ACH Payments (Aug 2007)**

- a. The Commonwealth will make contract payments through the Automated Clearing House (ACH). Within 10 days of award of the contract or purchase order, the contractor must submit or must have already submitted their ACH information within their user profile in the Commonwealth's procurement system (SRM).
- b. The contractor must submit a unique invoice number with each invoice submitted. The unique invoice number will be listed on the Commonwealth of Pennsylvania's ACH remittance advice to enable the contractor to properly apply the state agency's payment to the invoice submitted.
- c. It is the responsibility of the contractor to ensure that the ACH information contained in SRM is accurate and complete. Failure to maintain accurate and complete information may result in delays in payments.

#### **V.17 CONTRACT-017.1 Taxes (Dec 5 2006)**

The Commonwealth is exempt from all excise taxes imposed by the Internal Revenue Service and has accordingly

registered with the Internal Revenue Service to make tax free purchases under Registration No. 23-23740001-K. With the exception of purchases of the following items, no exemption certificates are required and none will be issued: undyed diesel fuel, tires, trucks, gas guzzler emergency vehicles, and sports fishing equipment. The Commonwealth is also exempt from Pennsylvania state sales tax, local sales tax, public transportation assistance taxes and fees and vehicle rental tax. The Department of Revenue regulations provide that exemption certificates are not required for sales made to governmental entities and none will be issued. Nothing in this paragraph is meant to exempt a construction contractor from the payment of any of these taxes or fees which are required to be paid with respect to the purchase, use, rental, or lease of tangible personal property or taxable services used or transferred in connection with the performance of a construction contract.

#### **V.18 CONTRACT-018.1 Assignment of Antitrust Claims (Oct 2006)**

The Contractor and the Commonwealth recognize that in actual economic practice, overcharges by the Contractor's suppliers resulting from violations of state or federal antitrust laws are in fact borne by the Commonwealth. As part of the consideration for the award of the Contract, and intending to be legally bound, the Contractor assigns to the Commonwealth all right, title and interest in and to any claims the Contractor now has, or may acquire, under state or federal antitrust laws relating to the products and services which are the subject of this Contract.

#### **V.19 CONTRACT-019.1 Hold Harmless Provision (Nov 30 2006)**

- a. The Contractor shall hold the Commonwealth harmless from and indemnify the Commonwealth against any and all third party claims, demands and actions based upon or arising out of any activities performed by the Contractor and its employees and agents under this Contract, provided the Commonwealth gives Contractor prompt notice of any such claim of which it learns. Pursuant to the Commonwealth Attorneys Act (71 P.S. Section 732-101, et seq.), the Office of Attorney General (OAG) has the sole authority to represent the Commonwealth in actions brought against the Commonwealth. The OAG may, however, in its sole discretion and under such terms as it deems appropriate, delegate its right of defense. If OAG delegates the defense to the Contractor, the Commonwealth will cooperate with all reasonable requests of Contractor made in the defense of such suits.
- b. Notwithstanding the above, neither party shall enter into any settlement without the other party's written consent, which shall not be unreasonably withheld. The Commonwealth may, in its sole discretion, allow the Contractor to control the defense and any related settlement negotiations.

#### **V.20 CONTRACT-020.1 Audit Provisions (Oct 2006)**

The Commonwealth shall have the right, at reasonable times and at a site designated by the Commonwealth, to audit the books, documents and records of the Contractor to the extent that the books, documents and records relate to costs or pricing data for the Contract. The Contractor agrees to maintain records which will support the prices charged and costs incurred for the Contract. The Contractor shall preserve books, documents, and records that relate to costs or pricing data for the Contract for a period of three (3) years from date of final payment. The Contractor shall give full and free access to all records to the Commonwealth and/or their authorized representatives.

#### **V.21 CONTRACT-020.2 Single Audit Act of 1984 (Oct 2013)**

In compliance with the *Single Audit Act of 1984*, the Contractor agrees to the following:

- a. This Contract is subject to audit by federal and state agencies or their authorized representative in accordance with the auditing standards promulgated by the Comptroller General of the United States and specified in *Government Auditing Standards*, 1994 Revisions (Yellow Book).
- b. The audit requirement of this Contract will be satisfied if a single audit is performed under the provisions of the *Single Audit Act of 1984*, 31 U.S.C. Section 7501, et seq, and all rules and regulations promulgated pursuant to the

Act.

c. The Commonwealth reserves the right for federal and state agencies or their authorized representatives to perform additional audits of a financial/compliance, economy/efficiency, or program results nature, if deemed necessary.

The Contractor further agrees to comply with requirements that may be issued by the state agency upon receipt of additional guidance received from the federal government regarding the *Single Audit Act of 1984*.

**V.22 CONTRACT-021.1 Default (Oct 2013)**

a. The Commonwealth may, subject to the Force Majeure provisions of this Contract, and in addition to its other rights under the Contract, declare the Contractor in default by written notice thereof to the Contractor, and terminate (as provided in the Termination Provisions of this Contract) the whole or any part of this Contract or any Purchase Order for any of the following reasons:

- 1) Failure to begin work within the time specified in the Contract or Purchase Order or as otherwise specified;
- 2) Failure to perform the work with sufficient labor, equipment, or material to ensure the completion of the specified work in accordance with the Contract or Purchase Order terms;
- 3) Unsatisfactory performance of the work;
- 4) Failure to deliver the awarded item(s) within the time specified in the Contract or Purchase Order or as otherwise specified;
- 5) Improper delivery;
- 6) Failure to provide an item(s) which is in conformance with the specifications referenced in the Contract or Purchase Order;
- 7) Delivery of a defective item;
- 8) Failure or refusal to remove material, or remove and replace any work rejected as defective or unsatisfactory;
- 9) Discontinuance of work without approval;
- 10) Failure to resume work, which has been discontinued, within a reasonable time after notice to do so;
- 11) Insolvency or bankruptcy;
- 12) Assignment made for the benefit of creditors;
- 13) Failure or refusal within 10 days after written notice by the Contracting Officer, to make payment or show cause why payment should not be made, of any amounts due for materials furnished, labor supplied or performed, for equipment rentals, or for utility services rendered;
- 14) Failure to protect, to repair, or to make good any damage or injury to property;
- 15) Breach of any provision of the Contract;
- 16) Failure to comply with representations made in the Contractor's bid/proposal; or
- 17) Failure to comply with applicable industry standards, customs, and practice.

b. In the event that the Commonwealth terminates this Contract or any Purchase Order in whole or in part as provided in Subparagraph a. above, the Commonwealth may procure, upon such terms and in such manner as it determines, items similar or identical to those so terminated, and the Contractor shall be liable to the Commonwealth for any reasonable excess costs for such similar or identical items included within the terminated

part of the Contract or Purchase Order.

c. If the Contract or a Purchase Order is terminated as provided in Subparagraph a. above, the Commonwealth, in addition to any other rights provided in this paragraph, may require the Contractor to transfer title and deliver immediately to the Commonwealth in the manner and to the extent directed by the Contracting Officer, such partially completed items, including, where applicable, reports, working papers and other documentation, as the Contractor has specifically produced or specifically acquired for the performance of such part of the Contract or Purchase Order as has been terminated. Except as provided below, payment for completed work accepted by the Commonwealth shall be at the Contract price. Except as provided below, payment for partially completed items including, where applicable, reports and working papers, delivered to and accepted by the Commonwealth shall be in an amount agreed upon by the Contractor and Contracting Officer. The Commonwealth may withhold from amounts otherwise due the Contractor for such completed or partially completed works, such sum as the Contracting Officer determines to be necessary to protect the Commonwealth against loss.

d. The rights and remedies of the Commonwealth provided in this paragraph shall not be exclusive and are in addition to any other rights and remedies provided by law or under this Contract.

e. The Commonwealth's failure to exercise any rights or remedies provided in this paragraph shall not be construed to be a waiver by the Commonwealth of its rights and remedies in regard to the event of default or any succeeding event of default.

f. Following exhaustion of the Contractor's administrative remedies as set forth in the Contract Controversies Provision of the Contract, the Contractor's exclusive remedy shall be to seek damages in the Board of Claims.

#### **V.23 CONTRACT-022.1 Force Majeure (Oct 2006)**

Neither party will incur any liability to the other if its performance of any obligation under this Contract is prevented or delayed by causes beyond its control and without the fault or negligence of either party. Causes beyond a party's control may include, but aren't limited to, acts of God or war, changes in controlling law, regulations, orders or the requirements of any governmental entity, severe weather conditions, civil disorders, natural disasters, fire, epidemics and quarantines, general strikes throughout the trade, and freight embargoes.

The Contractor shall notify the Commonwealth orally within five (5) days and in writing within ten (10) days of the date on which the Contractor becomes aware, or should have reasonably become aware, that such cause would prevent or delay its performance. Such notification shall (i) describe fully such cause(s) and its effect on performance, (ii) state whether performance under the contract is prevented or delayed and (iii) if performance is delayed, state a reasonable estimate of the duration of the delay. The Contractor shall have the burden of proving that such cause(s) delayed or prevented its performance despite its diligent efforts to perform and shall produce such supporting documentation as the Commonwealth may reasonably request. After receipt of such notification, the Commonwealth may elect to cancel the Contract, cancel the Purchase Order, or to extend the time for performance as reasonably necessary to compensate for the Contractor's delay.

In the event of a declared emergency by competent governmental authorities, the Commonwealth by notice to the Contractor, may suspend all or a portion of the Contract or Purchase Order.

#### **V.24 CONTRACT-023.1a Termination Provisions (Oct 2013)**

The Commonwealth has the right to terminate this Contract or any Purchase Order for any of the following reasons. Termination shall be effective upon written notice to the Contractor.

a. **TERMINATION FOR CONVENIENCE:** The Commonwealth shall have the right to terminate the Contract or a Purchase Order for its convenience if the Commonwealth determines termination to be in its best interest. The Contractor shall be paid for work satisfactorily completed prior to the effective date of the termination, but in no event shall the Contractor be entitled to recover loss of profits.

b. **NON-APPROPRIATION:** The Commonwealth's obligation to make payments during any Commonwealth fiscal year succeeding the current fiscal year shall be subject to availability and appropriation of funds. When funds

(state and/or federal) are not appropriated or otherwise made available to support continuation of performance in a subsequent fiscal year period, the Commonwealth shall have the right to terminate the Contract or a Purchase Order. The Contractor shall be reimbursed for the reasonable value of any nonrecurring costs incurred but not amortized in the price of the supplies or services delivered under the Contract. Such reimbursement shall not include loss of profit, loss of use of money, or administrative or overhead costs. The reimbursement amount may be paid from any appropriations available for that purpose.

c. **TERMINATION FOR CAUSE:** The Commonwealth shall have the right to terminate the Contract or a Purchase Order for Contractor default under the Default Clause upon written notice to the Contractor. The Commonwealth shall also have the right, upon written notice to the Contractor, to terminate the Contract or a Purchase Order for other cause as specified in the Contract or by law. If it is later determined that the Commonwealth erred in terminating the Contract or a Purchase Order for cause, then, at the Commonwealth's discretion, the Contract or Purchase Order shall be deemed to have been terminated for convenience under the Subparagraph a.

#### **V.25 CONTRACT-024.1 Contract Controversies (Oct 2011)**

a. In the event of a controversy or claim arising from the Contract, the Contractor must, within six months after the cause of action accrues, file a written claim with the contracting officer for a determination. The claim shall state all grounds upon which the Contractor asserts a controversy exists. If the Contractor fails to file a claim or files an untimely claim, the Contractor is deemed to have waived its right to assert a claim in any forum. At the time the claim is filed, or within sixty (60) days thereafter, either party may request mediation through the Commonwealth Office of General Counsel Dispute Resolution Program.

b. If the Contractor or the contracting officer requests mediation and the other party agrees, the contracting officer shall promptly make arrangements for mediation. Mediation shall be scheduled so as to not delay the issuance of the final determination beyond the required 120 days after receipt of the claim if mediation is unsuccessful. If mediation is not agreed to or if resolution is not reached through mediation, the contracting officer shall review timely-filed claims and issue a final determination, in writing, regarding the claim. The final determination shall be issued within 120 days of the receipt of the claim, unless extended by consent of the contracting officer and the Contractor. The contracting officer shall send his/her written determination to the Contractor. If the contracting officer fails to issue a final determination within the 120 days (unless extended by consent of the parties), the claim shall be deemed denied. The contracting officer's determination shall be the final order of the purchasing agency.

c. Within fifteen (15) days of the mailing date of the determination denying a claim or within 135 days of filing a claim if, no extension is agreed to by the parties, whichever occurs first, the Contractor may file a statement of claim with the Commonwealth Board of Claims. Pending a final judicial resolution of a controversy or claim, the Contractor shall proceed diligently with the performance of the Contract in a manner consistent with the determination of the contracting officer and the Commonwealth shall compensate the Contractor pursuant to the terms of the Contract.

#### **V.26 CONTRACT-025.1 Assignability and Subcontracting (Oct 2013)**

a. Subject to the terms and conditions of this paragraph, this Contract shall be binding upon the parties and their respective successors and assigns.

b. The Contractor shall not subcontract with any person or entity to perform all or any part of the work to be performed under this Contract without the prior written consent of the Contracting Officer, which consent may be withheld at the sole and absolute discretion of the Contracting Officer.

c. The Contractor may not assign, in whole or in part, this Contract or its rights, duties, obligations, or responsibilities hereunder without the prior written consent of the Contracting Officer, which consent may be withheld at the sole and absolute discretion of the Contracting Officer.

d. Notwithstanding the foregoing, the Contractor may, without the consent of the Contracting Officer, assign



its rights to payment to be received under the Contract, provided that the Contractor provides written notice of such assignment to the Contracting Officer together with a written acknowledgement from the assignee that any such payments are subject to all of the terms and conditions of this Contract.

e. For the purposes of this Contract, the term "assign" shall include, but shall not be limited to, the sale, gift, assignment, pledge, or other transfer of any ownership interest in the Contractor provided, however, that the term shall not apply to the sale or other transfer of stock of a publicly traded company.

f. Any assignment consented to by the Contracting Officer shall be evidenced by a written assignment agreement executed by the Contractor and its assignee in which the assignee agrees to be legally bound by all of the terms and conditions of the Contract and to assume the duties, obligations, and responsibilities being assigned.

g. A change of name by the Contractor, following which the Contractor's federal identification number remains unchanged, shall not be considered to be an assignment hereunder. The Contractor shall give the Contracting Officer written notice of any such change of name.

#### **V.27 CONTRACT-026.1 Other Contractors (Oct 2006)**

The Commonwealth may undertake or award other contracts for additional or related work, and the Contractor shall fully cooperate with other contractors and Commonwealth employees, and coordinate its work with such additional work as may be required. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor or by Commonwealth employees. This paragraph shall be included in the Contracts of all contractors with which this Contractor will be required to cooperate. The Commonwealth shall equitably enforce this paragraph as to all contractors to prevent the imposition of unreasonable burdens on any contractor.

#### **V.28 CONTRACT-027.1 Nondiscrimination/Sexual Harassment Clause (August 2017)**

The Contractor agrees:

1. In the hiring of any employee(s) for the manufacture of supplies, performance of work, or any other activity required under the contract or any subcontract, the Contractor, each subcontractor, or any person acting on behalf of the Contractor or subcontractor shall not discriminate by reason of race, gender, creed, color, sexual orientation, gender identity or expression, or in violation of the *Pennsylvania Human Relations Act* (PHRA) and applicable federal laws, against any citizen of this Commonwealth who is qualified and available to perform the work to which the employment relates.

2. Neither the Contractor nor any subcontractor nor any person on their behalf shall in any manner discriminate by reason of race, gender, creed, color, sexual orientation, gender identity or expression, or in violation of the PHRA and applicable federal laws, against or intimidate any employee involved in the manufacture of supplies, the performance of work, or any other activity required under the contract.

3. The Contractor and each subcontractor shall establish and maintain a written nondiscrimination and sexual harassment policy and shall inform their employees in writing of the policy. The policy must contain a provision that sexual harassment will not be tolerated and employees who practice it will be disciplined. Posting this Nondiscrimination/Sexual Harassment Clause conspicuously in easily-accessible and well-lighted places customarily frequented by employees and at or near where the contracted services are performed shall satisfy this requirement for employees with an established work site.

4. The Contractor and each subcontractor shall not discriminate by reason of race, gender, creed, color, sexual orientation, gender identity or expression, or in violation of PHRA and applicable federal laws, against any subcontractor or supplier who is qualified to perform the work to which the contract relates.

5. The Contractor and each subcontractor represents that it is presently in compliance with and will maintain compliance with all applicable federal, state, and local laws, regulations and policies relating to nondiscrimination

and sexual harassment. The Contractor and each subcontractor further represents that it has filed a Standard Form 100 Employer Information Report ("EEO-1") with the U.S. Equal Employment Opportunity Commission ("EEOC") and shall file an annual EEO-1 report with the EEOC as required for employers' subject to *Title VII of the Civil Rights Act of 1964*, as amended, that have 100 or more employees and employers that have federal government contracts or first-tier subcontracts and have 50 or more employees. The Contractor and each subcontractor shall, upon request and within the time periods requested by the Commonwealth, furnish all necessary employment documents and records, including EEO-1 reports, and permit access to their books, records, and accounts by the contracting agency and the Bureau of Diversity, Inclusion and Small Business Opportunities for purpose of ascertaining compliance with provisions of this Nondiscrimination/Sexual Harassment Clause.

6. The Contractor shall include the provisions of this Nondiscrimination/Sexual Harassment Clause in every subcontract so that those provisions applicable to subcontractors will be binding upon each subcontractor.

7. The Contractor's and each subcontractor's obligations pursuant to these provisions are ongoing from and after the effective date of the contract through the termination date thereof. Accordingly, the Contractor and each subcontractor shall have an obligation to inform the Commonwealth if, at any time during the term of the contract, it becomes aware of any actions or occurrences that would result in violation of these provisions.

8. The Commonwealth may cancel or terminate the contract and all money due or to become due under the contract may be forfeited for a violation of the terms and conditions of this Nondiscrimination/Sexual Harassment Clause. In addition, the agency may proceed with debarment or suspension and may place the Contractor in the Contractor Responsibility File.

#### **V.29 CONTRACT-028.1 Contractor Integrity Provisions (January 2015)**

It is essential that those who seek to contract with the Commonwealth of Pennsylvania ("Commonwealth") observe high standards of honesty and integrity. They must conduct themselves in a manner that fosters public confidence in the integrity of the Commonwealth contracting and procurement process.

**1. DEFINITIONS.** For purposes of these Contractor Integrity Provisions, the following terms shall have the meanings found in this Section:

**a. "Affiliate"** means two or more entities where (a) a parent entity owns more than fifty percent of the voting stock of each of the entities; or (b) a common shareholder or group of shareholders owns more than fifty percent of the voting stock of each of the entities; or (c) the entities have a common proprietor or general partner.

**b. "Consent"** means written permission signed by a duly authorized officer or employee of the Commonwealth, provided that where the material facts have been disclosed, in writing, by prequalification, bid, proposal, or contractual terms, the Commonwealth shall be deemed to have consented by virtue of the execution of this contract.

**c. "Contractor"** means the individual or entity, that has entered into this contract with the Commonwealth.

**d. "Contractor Related Parties"** means any affiliates of the Contractor and the Contractor's executive officers, Pennsylvania officers and directors, or owners of 5 percent or more interest in the Contractor.

**e. "Financial Interest"** means either:

(1) Ownership of more than a five percent interest in any business; or

(2) Holding a position as an officer, director, trustee, partner, employee, or holding any position of management.

**f. "Gratuity"** means tendering, giving, or providing anything of more than nominal monetary value including, but not limited to, cash, travel, entertainment, gifts, meals, lodging, loans, subscriptions, advances, deposits of money, services, employment, or contracts of any kind. The exceptions set forth in the *Governor's Code of Conduct, Executive Order 1980-18, the 4 Pa. Code §7.153(b)*, shall apply.

**g. "Non-bid Basis"** means a contract awarded or executed by the Commonwealth with Contractor without seeking

bids or proposals from any other potential bidder or offeror.

**2.** In furtherance of this policy, Contractor agrees to the following:

- a.** Contractor shall maintain the highest standards of honesty and integrity during the performance of this contract and shall take no action in violation of state or federal laws or regulations or any other applicable laws or regulations, or other requirements applicable to Contractor or that govern contracting or procurement with the Commonwealth.
- b.** Contractor shall establish and implement a written business integrity policy, which includes, at a minimum, the requirements of these provisions as they relate to the Contractor activity with the Commonwealth and Commonwealth employees and which is made known to all Contractor employees. Posting these Contractor Integrity Provisions conspicuously in easily-accessible and well-lighted places customarily frequented by employees and at or near where the contract services are performed shall satisfy this requirement.
- c.** Contractor, its affiliates, agents, employees and anyone in privity with Contractor shall not accept, agree to give, offer, confer or agree to confer or promise to confer, directly or indirectly, any gratuity or pecuniary benefit to any person, or to influence or attempt to influence any person in violation of any federal or state law, regulation, executive order of the Governor of Pennsylvania, statement of policy, management directive or any other published standard of the Commonwealth in connection with performance of work under this contract, except as provided in this contract.
- d.** Contractor shall not have a financial interest in any other contractor, subcontractor, or supplier providing services, labor or material under this contract, unless the financial interest is disclosed to the Commonwealth in writing and the Commonwealth consents to Contractor's financial interest prior to Commonwealth execution of the contract. Contractor shall disclose the financial interest to the Commonwealth at the time of bid or proposal submission, or if no bids or proposals are solicited, no later than the Contractor's submission of the contract signed by Contractor.
- e.** Contractor certifies to the best of its knowledge and belief that within the last five (5) years Contractor or Contractor Related Parties have not:
  - (1)** been indicted or convicted of a crime involving moral turpitude or business honesty or integrity in any jurisdiction;
  - (2)** been suspended, debarred or otherwise disqualified from entering into any contract with any governmental agency;
  - (3)** had any business license or professional license suspended or revoked;
  - (4)** had any sanction or finding of fact imposed as a result of a judicial or administrative proceeding related to fraud, extortion, bribery, bid rigging, embezzlement, misrepresentation or anti-trust; and
  - (5)** been, and is not currently, the subject of a criminal investigation by any federal, state or local prosecuting or investigative agency and/or civil anti-trust investigation by any federal, state or local prosecuting or investigative agency.

If Contractor cannot so certify to the above, then it must submit along with its bid, proposal or contract a written explanation of why such certification cannot be made and the Commonwealth will determine whether a contract may be entered into with the Contractor. The Contractor's obligation pursuant to this certification is ongoing from and after the effective date of the contract through the termination date thereof. Accordingly, the Contractor shall have an obligation to immediately notify the Commonwealth in writing if at any time during the term of the contract it becomes aware of any event which would cause the Contractor's certification or explanation to change. Contractor acknowledges that the Commonwealth may, in its sole discretion, terminate the contract for cause if it learns that any of the certifications made herein are currently false due to intervening factual circumstances or were false or should have been known to be false when entering into the contract.

**f.** Contractor shall comply with the requirements of the *Lobbying Disclosure Act (65 Pa.C.S. §13A01 et seq.)*

regardless of the method of award. If this contract was awarded on a Non-bid Basis, Contractor must also comply with the requirements of the *Section 1641 of the Pennsylvania Election Code (25 P.S. §3260a)*.

**g.** When contractor has reason to believe that any breach of ethical standards as set forth in law, the Governor's Code of Conduct, or these Contractor Integrity Provisions has occurred or may occur, including but not limited to contact by a Commonwealth officer or employee which, if acted upon, would violate such ethical standards, Contractor shall immediately notify the Commonwealth contracting officer or the Office of the State Inspector General in writing.

**h.** Contractor, by submission of its bid or proposal and/or execution of this contract and by the submission of any bills, invoices or requests for payment pursuant to the contract, certifies and represents that is has not violated any of these Contractor Integrity Provisions in connection with the submission of the bid or proposal, during any contract negotiations or during the term of the contract, to include any extensions thereof. Contractor shall immediately notify the Commonwealth in writing of any actions for occurrences that would result in a violation of these Contractor Integrity Provisions. Contractor agrees to reimburse the Commonwealth for the reasonable costs of investigation incurred by the Office of the State Inspector General for investigations of the Contractor's compliance with the terms of this or any other agreement between the Contractor and the Commonwealth that results in the suspension or debarment of the Contractor. Contractor shall not be responsible for investigative costs for investigations that do not result in the Contractor's suspension or debarment.

**i.** Contractor shall cooperate with the Office of the State Inspector General in its investigation of any alleged Commonwealth agency or employee breach of ethical standards and any alleged Contractor non-compliance with these Contractor Integrity Provisions. Contractor agrees to make identified Contractor employees available for interviews at reasonable times and places. Contractor, upon the inquiry or request of an Inspector General, shall provide, or if appropriate, make promptly available for inspection or copying, any information of any type or form deemed relevant by the Office of the State Inspector General to Contractor's integrity and compliance with these provisions. Such information may include, but shall not be limited to, Contractor's business or financial records, documents or files of any type or form that refer to or concern this contract. Contractor shall incorporate this paragraph in any agreement, contract or subcontract it enters into in the course of the performance of this contract/agreement solely for the purpose of obtaining subcontractor compliance with this provision. The incorporation of this provision in a subcontract shall not create privity of contract between the Commonwealth and any such subcontractor, and no third party beneficiaries shall be created thereby.

**j.** For violation of any of these Contractor Integrity Provisions, the Commonwealth may terminate this and any other contract with Contractor, claim liquidated damages in an amount equal to the value of anything received in breach of these Provisions, claim damages for all additional costs and expenses incurred in obtaining another contractor to complete performance under this contract, and debar and suspend Contractor from doing business with the Commonwealth. These rights and remedies are cumulative, and the use or non-use of any one shall not preclude the use of all or any other. These rights and remedies are in addition to those the Commonwealth may have under law, statute, regulation or otherwise.

### **V.30 CONTRACT-029.1 Contractor Responsibility Provisions (Nov 2010)**

For the purpose of these provisions, the term contractor is defined as any person, including, but not limited to, a bidder, offeror, loan recipient, grantee or lessor, who has furnished or performed or seeks to furnish or perform, goods, supplies, services, leased space, construction or other activity, under a contract, grant, lease, purchase order or reimbursement agreement with the Commonwealth of Pennsylvania (Commonwealth). The term contractor includes a permittee, licensee, or any agency, political subdivision, instrumentality, public authority, or other public entity in the Commonwealth.

**1.** The Contractor certifies, in writing, for itself and its subcontractors required to be disclosed or approved by the Commonwealth, that as of the date of its execution of this Bid/Contract, that neither the Contractor, nor any such subcontractors, are under suspension or debarment by the Commonwealth or any governmental entity, instrumentality, or authority and, if the Contractor cannot so certify, then it agrees to submit, along with its Bid/Contract, a written explanation of why such certification cannot be made.

2. The Contractor also certifies, in writing, that as of the date of its execution of this Bid/Contract it has no tax liabilities or other Commonwealth obligations, or has filed a timely administrative or judicial appeal if such liabilities or obligations exist, or is subject to a duly approved deferred payment plan if such liabilities exist.
3. The Contractor's obligations pursuant to these provisions are ongoing from and after the effective date of the Contract through the termination date thereof. Accordingly, the Contractor shall have an obligation to inform the Commonwealth if, at any time during the term of the Contract, it becomes delinquent in the payment of taxes, or other Commonwealth obligations, or if it or, to the best knowledge of the Contractor, any of its subcontractors are suspended or debarred by the Commonwealth, the federal government, or any other state or governmental entity. Such notification shall be made within 15 days of the date of suspension or debarment.
4. The failure of the Contractor to notify the Commonwealth of its suspension or debarment by the Commonwealth, any other state, or the federal government shall constitute an event of default of the Contract with the Commonwealth.
5. The Contractor agrees to reimburse the Commonwealth for the reasonable costs of investigation incurred by the Office of State Inspector General for investigations of the Contractor's compliance with the terms of this or any other agreement between the Contractor and the Commonwealth that results in the suspension or debarment of the contractor. Such costs shall include, but shall not be limited to, salaries of investigators, including overtime; travel and lodging expenses; and expert witness and documentary fees. The Contractor shall not be responsible for investigative costs for investigations that do not result in the Contractor's suspension or debarment.
6. The Contractor may obtain a current list of suspended and debarred Commonwealth contractors by either searching the Internet at <http://www.dgs.state.pa.us/> or contacting the:

Department of General Services  
Office of Chief Counsel  
603 North Office Building  
Harrisburg, PA 17125  
Telephone No: (717) 783-6472  
FAX No: (717) 787-9138

#### **V.31 CONTRACT-030.1 Americans with Disabilities Act (Oct 2006)**

- a. Pursuant to federal regulations promulgated under the authority of The Americans With Disabilities Act, 28 C.F.R. Section 35.101 et seq., the Contractor understands and agrees that it shall not cause any individual with a disability to be excluded from participation in this Contract or from activities provided for under this Contract on the basis of the disability. As a condition of accepting this contract, the Contractor agrees to comply with the "General Prohibitions Against Discrimination," 28 C.F.R. Section 35.130, and all other regulations promulgated under Title II of The Americans With Disabilities Act which are applicable to all benefits, services, programs, and activities provided by the Commonwealth of Pennsylvania through contracts with outside contractors.
- b. The Contractor shall be responsible for and agrees to indemnify and hold harmless the Commonwealth of Pennsylvania from all losses, damages, expenses, claims, demands, suits, and actions brought by any party against the Commonwealth of Pennsylvania as a result of the Contractor's failure to comply with the provisions of Subparagraph a. above.

#### **V.32 CONTRACT-032.1 Covenant Against Contingent Fees (Oct 2006)**

The Contractor warrants that no person or selling agency has been employed or retained to solicit or secure the Contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, except bona fide employees or bona fide established commercial or selling agencies maintained by the Contractor for the purpose of securing business. For breach or violation of this warranty, the Commonwealth shall have the right to terminate the Contract without liability or in its discretion to deduct from the Contract price or consideration, or otherwise recover the full amount of such commission, percentage, brokerage, or contingent fee.

### **V.33 CONTRACT-033.1 Applicable Law (Oct 2006)**

This Contract shall be governed by and interpreted and enforced in accordance with the laws of the Commonwealth of Pennsylvania (without regard to any conflict of laws provisions) and the decisions of the Pennsylvania courts. The Contractor consents to the jurisdiction of any court of the Commonwealth of Pennsylvania and any federal courts in Pennsylvania, waiving any claim or defense that such forum is not convenient or proper. The Contractor agrees that any such court shall have in personam jurisdiction over it, and consents to service of process in any manner authorized by Pennsylvania law.

### **V.34 CONTRACT- 034.1b Integration (Nov 30 2006)**

This Contract, including the Invitation for Bids, the Contractor's bid, all referenced documents, and any Purchase Order constitutes the entire agreement between the parties. No agent, representative, employee or officer of either the Commonwealth or the Contractor has authority to make, or has made, any statement, agreement or representation, oral or written, in connection with the Contract, which in any way can be deemed to modify, add to or detract from, or otherwise change or alter its terms and conditions. No negotiations between the parties, nor any custom or usage, shall be permitted to modify or contradict any of the terms and conditions of the Contract. No modifications, alterations, changes, or waiver to the Contract or any of its terms shall be valid or binding unless accomplished by a written amendment signed by both parties.

### **V.35 CONTRACT-034.2b Order of Precedence - IFB (Dec 6 2006)**

In the event there is a conflict among the documents comprising this Contract, the Commonwealth and the Contractor agree on the following order of precedence: the Contract; the IFB; and the Contractor's Bid in Response to the IFB.

### **V.36 CONTRACT-034.3 Controlling Terms and Conditions (Aug 2011)**

The terms and conditions of this Contract shall be the exclusive terms of agreement between the Contractor and the Commonwealth. All quotations requested and received from the Contractor are for obtaining firm pricing only. Other terms and conditions or additional terms and conditions included or referenced in the Contractor's quotations, invoices, business forms, or other documentation shall not become part of the parties' agreement and shall be disregarded by the parties, unenforceable by the Contractor and not binding on the Commonwealth.

### **V.37 CONTRACT-035.1a Changes (Oct 2006)**

The Commonwealth reserves the right to make changes at any time during the term of the Contract or any renewals or extensions thereof: 1) to increase or decrease the quantities resulting from variations between any estimated quantities in the Contract and actual quantities; 2) to make changes to the services within the scope of the Contract; 3) to notify the Contractor that the Commonwealth is exercising any Contract renewal or extension option; or 4) to modify the time of performance that does not alter the scope of the Contract to extend the completion date beyond the Expiration Date of the Contract or any renewals or extensions thereof. Any such change shall be made by the Contracting Officer by notifying the Contractor in writing. The change shall be effective as of the date of the change, unless the notification of change specifies a later effective date. Such increases, decreases, changes, or modifications will not invalidate the Contract, nor, if performance security is being furnished in conjunction with the Contract, release the security obligation. The Contractor agrees to provide the service in accordance with the change order. Any dispute by the Contractor in regard to the performance required by any notification of change shall be handled through Contract Controversies Provision.

### **V.38 CONTRACT-045.1 Insurance - General (Dec 12 2006)**

The Contractor is required to have in place during the term of the Contract and any renewals or extensions thereof, the following types of insurance, issued by companies acceptable to the Commonwealth and authorized to conduct such business under the laws of the Commonwealth of Pennsylvania:

- A. **Worker's Compensation Insurance** for all of the Contractor's employees and those of any subcontractor, engaged in work at the site of the project as required by law.
- B. **Public Liability and Property Damage Insurance** to protect the Commonwealth, the Contractor, and any and all subcontractors from claims for damages for personal injury (including bodily injury), sickness or disease, accidental death and damage to property including the loss of use resulting from any property damage, which may arise from the activities performed under the Contract or the failure to perform under the Contract, whether such performance or non-performance be by the Contractor, by any subcontractor, or by anyone directly or indirectly employed by either. The minimum amounts of coverage shall be \$250,000 per person and \$1,000,000 per occurrence for bodily injury, including death, and \$250,000 per person and \$1,000,000 per occurrence for property damage. Such policies shall be occurrence rather than claims-made policies and shall not contain any endorsements or any other form designated to limit and restrict any action by the Commonwealth, as an additional insured, against the insurance coverage in regard to work performed for the Commonwealth.

Prior to commencement of the work under the Contract and at each insurance renewal date during the term of the Contract, the Contractor shall provide the Commonwealth with current certificates of insurance. These certificates or policies shall name the Commonwealth as an additional insured and shall contain a provision that the coverage's afforded under the policies will not be cancelled or changed until at least thirty (30) days written notice has been given to the Commonwealth.

The Commonwealth shall be under no obligation to obtain such certificates from the Contractor(s). Failure by the Commonwealth to obtain the certificates shall not be deemed a waiver of the Contractor's obligation to obtain and furnish certificates. The Commonwealth shall have the right to inspect the original insurance policies.

#### **V.39 CONTRACT-048.1a Performance Security (Oct 2006)**

- a. The Contractor must furnish within ten (10) days after award of the purchase order the following:
  - (1) For purchase orders between \$25,000.00 and \$100,000.00, performance security in an amount equal to at least 50 percent of the purchase order price.
  - (2) For purchase orders in excess of \$100,000, a performance bond at one hundred percent of the contract amount, conditioned upon the faithful performance of the contract in accordance with the plans, specifications and conditions of the contract. The bond shall be solely for the protection of the contracting body which awarded the contract.
- b. Failure to furnish the required performance security within the required ten (10) days time frame shall be considered a failure to perform a contractual obligation which may result in termination of the purchase order and award to another supplier. In the event of termination and re-award for failure to provide performance security, the contractor shall be responsible for any increase in cost to the Commonwealth.
- c. Where the Contractor does not comply with the requirements of the purchase order, the amount of the performance security shall be paid to the Commonwealth as liquidated damages for the contractor's failure to comply, or the Commonwealth may, at its sole option, sue the contractor or its surety for the damages it has suffered for any breach of contract, in which case security held by the Commonwealth shall be applied as a credit in such suit for damages.
- d. For purchase orders under \$25,000.00, no performance security will be required.

#### **V.40 CONTRACT-048.1c Contract Performance Security (May 2016)**

The Contractor is required, no later than ten (10) days after the Contract Effective Date, to submit performance

security in the amount of 10.00 % of the total price of the contract. Performance security must be in the form of a specific performance bond, an irrevocable letter of credit or a certificate of deposit, all in a form acceptable to the Commonwealth, or a certified check or a bank cashier's check drawn to the order of the "Commonwealth of Pennsylvania". All performance security shall be conditioned for faithful performance of the contract or purchase order(s). Failure to provide performance security within ten (10) days after the Contract Effective Date shall be considered an event of default.

Where the Contractor does not comply with the Contract or a purchase order, the amount of the Commonwealth's damages shall be liquidated to the amount of the proceeds of the check, performance bond, letter of credit, certificate of deposit, or escrow account or the Commonwealth may, at its option, bring legal action against the Contractor or its surety for the damages it has suffered for any default, in which case security held by the Commonwealth shall be applied as a credit in such suit for damages. Checks deposited with the Commonwealth as security shall be placed in authorized state depositories by the Treasury Department as required by the Fiscal Code, 72 P.S. Section 301. Checks shall be returned to contractors upon completion of the performance of their obligations under the Contract or purchase order. If an irrevocable letter of credit, certificate of deposit, or escrow account is submitted, the document must require the financial institution to pay to the Commonwealth, upon written notice, the amount demanded by the Commonwealth up to the amount of the irrevocable letter of credit, escrow account, or certificate of deposit.

#### **V.41 CONTRACT-048.2 Payment Bond (Oct 2006)**

- a. For purchase orders in excess of \$100,000.00, the awarded contractor must furnish a payment bond in an amount equal to 100 percent of the contract amount. The payment bond must be executed by a surety company authorized to do business in the Commonwealth and made payable to the Commonwealth.
- b. The payment bond shall be conditioned on the prompt payment for all materials furnished or labor supplied or performed in the performance of the work. Labor and materials include public utility services and reasonable rentals of equipment for the periods when the equipment rented is actually used at the site.
- c. A payment bond shall be solely for the protection of claimants supplying labor and materials to the awarded contractor, or to any of its subcontractors, in the performance of the work provided for in the contract.
- d. The awarded contractor must furnish the payment bond within ten (10) days after award of the purchase order.

#### **V.42 CONTRACT-048.3 Commencement of Work (Oct 2006)**

The Contractor should not begin work until all required security and insurance certificates, if required, have been submitted to and approved by the Commonwealth. If required security and insurance certificates are not submitted within required time frames, the Commonwealth has the right to cancel this order and surcharge your company for any increase in price.

#### **V.43 CONTRACT-050.01a Steel Products Procurement Act "A" (Oct 2009)**

In the performance of any contract awarded pursuant to this invitation to bid, the contractor and all subcontractors, materialmen, and suppliers shall use only "steel products" as defined in the Steel Products Procurement Act, Act of March 3, 1978, P.L. 6, No. 3, 73 P.S. §§ 1881-1887 ("SPPA"), including products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated or otherwise similarly processed, or processed by a combination of two or more of such operations, from steel made in the United States by the open hearth, basic oxygen, electric furnace, Bessemer or other steel making process. The definition of steel products also includes cast iron products, as well as machinery and equipment listed in United States Department of Commerce Standard Industrial Classification 25 (furniture and fixture), 35 (machinery, except electrical) and 37 (transportation equipment) and made of, fabricated from, or containing steel components. If a product contains both foreign and United States steel, such products shall be determined to be a United States Steel product only if at least 75% of the cost of the articles, materials and supplies have been mined, produced or manufactured, as the case may be, in the United States. Transportation equipment shall be determined to be a United States steel product only if it complies with Section 165 of Public Law 97-424 (96 Stat. 2136).

The SPPA provides that, when a contractor supplies unidentified steel products for a public agency's use as part of any Public Works Project, before a public agency may authorize, provide for, or make payment, the Contractor must provide documentation including, but not limited to, invoices, bills of lading and mill certification that the steel was melted and manufactured in the United States before a public agency may authorize, provide for, or make



payment. If a steel product is identifiable on its face, the contractor must submit certification which satisfies the purchasing agency that the contractor has fully complied with this provision.

If a purchasing agency has made any payment to the Contractor and later finds that the Contractor did not comply with the SPPA's requirements, the purchasing agency may recover such payment directly from the Contractor. The Contractor shall not deny repayment unless it can demonstrate that it has complied with the SPPA's requirements.

The SPPA also provides that any person who willfully violates any of its provisions shall be prohibited from submitting any bids to any public agency for a period of five years after the date of the determination that a violation has occurred. If the Contractor violates the SPPA, the public agency may debar the Contractor from performing any work or supplying any materials to a public agency for five years after the date of the determination that a violation has occurred.

The Contractor shall include these provisions regarding the SPPA's requirements in its subcontracts and supply contracts, so that the SPPA's provisions of the Act shall be binding upon each subcontractor and supplier.

**V.44 CONTRACT-050.02 Prohibition Against The Use of Certain Steel and Aluminum Products (Oct 2009)**

In accordance with the Trade Practices Act of July 23, 1968 P.L. 686 (71 P.S. §773.101 et seq.), the Contractor cannot and shall not use or permit to be used in the work any aluminum or steel products made in a foreign country which is listed below as a foreign country which discriminates against aluminum or steel products manufactured in Pennsylvania. The countries of Brazil, South Korea, Spain and Argentina have been found to discriminate against certain products manufactured in Pennsylvania. Therefore, the purchase or use of those countries' products, as listed below, is not permitted.

1. BRAZIL: Welded carbon steel pipes and tubes; carbon steel wire rods; tool steel; certain steel products, including hot-rolled stainless steel bar; stainless steel wire rod and cold-formed stainless steel bar; pre-stressed concrete steel wire strand; hot-rolled carbon steel plate in coil; hot-rolled carbon steel sheet and cold-rolled carbon steel sheet.
2. SPAIN: Certain stainless steel products, including stainless steel wire rod, hot-rolled stainless steel bars and cold-formed stainless steel bars; pre-stressed concrete steel wire strands; certain steel products, including hot-rolled steel plate, cold-rolled carbon steel plate, carbon steel structural shapes, galvanized carbon steel sheet, hot-rolled carbon steel bars and cold-formed carbon steel bars.
3. SOUTH KOREA : Welded carbon steel pipes and tubes hot-rolled carbon steel plate; hot-rolled carbon steel sheet and galvanized steel sheet.
4. ARGENTINA : Carbon steel wire rod and cold-rolled carbon steel sheet.

Penalties for violations of this paragraph may be found in the Trade Practices Act, which penalties include becoming ineligible for public works contracts for a period of three years.

Note: This provision in no way relieves the Contractor of its responsibility to comply with those provisions of this Agreement that prohibit the use of foreign-made steel and cast iron products.

**V.45 CONTRACT-050.03 Separation for Plumbing, Heating, Ventilation and Electrical Work (Oct 2006)**

The contract shall be subject to the provisions of the Act of May 1, 1913 (P.L. 155, No. 104); 71 P.S. Section 1618.

**V.46 CONTRACT-050.04 Progress Payments (Oct 2006)**

Based upon Applications for Payment submitted to the Agency by the Contractor, the Agency will make progress payments on account of the Price to the Contractor, as provided below.

**V.47 CONTRACT-050.05 Schedule of Progress Payments (Oct 2006)**

Within thirty (30) days of the Effective Date of this Agreement and prior to the first Application for Payment, the Contractor shall submit to the Agency for approval, a detailed Contract Breakdown Sheet, indicating a Schedule of Progress Payments for all work, equipment, and materials required for the acquisition and installation of the Security System (the "Work"). The total amount to be paid according to the Schedule of Progress Payments must equal the Price. The progress payments on the Schedule must be divided so as to facilitate payments to subcontractors, and be prepared in such form as specified by the Agency and supported by such data required by the Agency to

substantiate its correctness. Each item in the Schedule of Progress Payments shall include its proper share of any overhead and profit. When more than one building or structure is included in a project, the contractor shall submit a Contract Breakdown Sheet, indicating Unit Prices for all items of Work within the separate buildings or structures. The Schedule of Progress Payments, when approved by the Agency, will be used as a basis for the Contractor's Application for Payments. This schedule may also be used by the Agency to determine the cost or credit to the Agency resulting from the changes in the Work.

**V.48 CONTRACT-050.06 Application for Progress Payments (Oct 2006)**

During the progress of the Work, in accordance with the Agreement, the Contractor shall prepare periodic estimates of the value of the Work performed and shall submit to the Agency itemized Applications for Payment. The applications shall be supported by data, as required by the Agency substantiating the Contractor's right to payment.

**V.49 CONTRACT-050.07 Stored Materials (Oct 2006)**

Upon the determination of the Agency as to reasonableness, payments may be made to the Contractor on account of materials or equipment not incorporated in the Work but delivered and suitably stored at the site, or at some other location agreed upon in writing. Contractor shall remain responsible for all losses of materials and equipment, which remain under its custody and control, regardless of the exclusions in the insurance policies.

Upon the determination of the Agency as to reasonableness, payments may be made to the Contractor on account of materials or equipment not incorporated in the Work but delivered and suitably stored at the site, or at some other location agreed upon in writing. Contractor shall remain responsible for all losses of materials and equipment, which remain under its custody and control, regardless of the exclusions in the insurance policies.

**V.50 CONTRACT-050.08 Contractor Warrants That Title To All Work, Equipment and Materials Associated with the Security System Passes Free of Liens (Oct 2006)**

The Contractor warrants and guarantees that title to all Work covered by an Application for Payment, whether incorporated in the Security System or not, will pass to the Agency upon the receipt of such payment by the Contractor, free and clear of all liens, claims, security interests or encumbrances, hereinafter referred to in these Sections as "liens"; and that no work, materials or equipment covered by an Application for Payment was acquired by the Contractor, or by any other person performing the Work at the site of furnishing materials and equipment for the Security System, subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or such other person.

**V.51 CONTRACT-050.09 Neither Payment Nor Occupancy Accepts Work Not in Conformance with Contract Documents (Oct 2006)**

No Application for Payment, nor any progress payment, nor any partial or entire use of occupancy of the Security System by the Agency constitutes an acceptance of any Work not in accordance with the Agreement.

**V.52 CONTRACT-050.10 Payments Withheld (Oct 2006)**

The Agency may decline to approve an Application for Payment in whole or in part if the Work has not progressed to the point indicated, or the quality and quantity of the Work is not in accordance with the Agreement. The Agency may also decline to approve any Applications for Payment, because of subsequently discovered evidence or subsequent inspections, which may nullify the whole or any part of any Application for Payment previously issued to such extent as may be necessary in its opinion to protect the agency from loss because of:

- (1) Defective work not remedied;
- (2) Claims filed or reasonable evidence indicating probable filing of claims;
- (3) Reasonable doubt that the work can be completed for the unpaid balance of the contract sum;
- (4) Damages to another prime contractor or subcontractor;
- (5) Reasonable indication that the Work will not be completed within the contract time;
- (6) Unsatisfactory prosecution of the Work by the Contractor, or
- (7) Failure of the Contractor to pay subcontractors or suppliers. It is within the Agency's discretion to withhold payment because of the Contractor's failure to pay subcontractors or suppliers. The failure to withhold payment for this reason does not give rise to a cause of action on the part of the subcontractor or supplier.
- (8) Failure of the Contractor to maintain insurance.

The Agency will notify the Contractor of the reason for withholding payment within fifteen (15) days of its receipt of the Application for Payment.

**V.53 CONTRACT-050.11 Payments Made When Grounds Are Removed (Oct 2006)**

When the grounds set out in the preceding subsection are removed, payment shall be made for amounts withheld because of them.

**V.54 CONTRACT-050.12 Retainage (Oct 2006)**

In computing the amount payable in accordance with this Article on any current Application for Payment:

- (1) Ten percent (10%) [*six percent (6%) for the Department of General Services*] of the then total applications for Payment shall be deducted and retained by the Agency until fifty percent (50%) of the Work called for by the Agreement has been satisfactorily completed and all Contract obligations have been met as determined by the Agency.
- (2) Upon completion of fifty percent (50%) of the work called for by the Agreement, the Work having been satisfactorily completed and all Agreement obligations having been met as determined by the Agency, the retainage withheld by the Agency shall be reduced to three percent (3%) of the original Agreement sum.

**V.55 CONTRACT-050.13 Money Withheld Due To Claims of One Prime Based on Delay of Another (Oct 2006)**

In the event a dispute arises between the Agency and another contractor, which dispute is based upon increased costs claimed by the other contractor occasioned by delays or other actions of Contractor, additional retainage in the sum of one and one-half (1-1/2) times the amount of any possible liability may be withheld from the Contractor until such time as a final resolution is agreed to by all parties directly or indirectly involved, unless the Contractor furnishes a bond satisfactory to the Agency to indemnify the Agency against the claim.

**V.56 CONTRACT-050.14 Failure of Payment (Oct 2006)**

If the Agency fails to make payment to the Contractor within sixty (60) days after receipt of the Application for Payment, the Contractor may file a claim with the Agency contracting officer. Contractor is not entitled to stop work in any event.

**V.57 CONTRACT-050.15 Occupancy (Oct 2006)**

The Agency may use and occupy any completed or partially completed portions of the Work, whether or not the time may have expired for completing the entire Work or said portions of Work. Such use or occupancy shall not be deemed an acceptance of the portion of the Work so taken or used. Prior to such use or occupancy, an inspection of the Work to be occupied by the Agency shall be made by the Agency to determine if it is in conformity with the Agreement. Any damage subsequent to the inspection due solely to the use and occupancy of the completed portion is not the responsibility of the Contractor.

**V.58 CONTRACT-050.16 Final Inspection (Oct 2006)**

When the Contractor submits in writing to the Agency a request for a final inspection and an application for final payment, final inspection will be made within 30 days of the receipt of the request for final inspection and application for final payment. If the Work is substantially completed, the Agency will issue a certificate of final completion and final certificate for payment and the Agency will make payment in full within forty-five (45) days except as set out in this Section, less one and one-half times the amount required to complete any then-remaining uncompleted minor items. The Agency shall list in detail each uncompleted item and a reasonable cost of completion. Final payment of any amount withheld for the completion of minor items shall be paid upon completion of the items in the list. The Contractor shall complete all items (items to be corrected and/or completed) within thirty (30) days after the date of final inspection or show just cause to the satisfaction of the Agency why they cannot be completed. If the Contractor does not complete the punch list items within thirty (30) days, or show just cause to the satisfaction of the Agency why they cannot be completed, the Agency may correct those items and deduct the cost of completion from the amount retained.

**V.59 CONTRACT-050.17 Final Payment (Oct 2006)**

Final payment, constituting the entire unpaid balance of the Contract sum, will be paid by the Agency to the Contractor within thirty (30) days after final inspection of the installed Security System, if the Contract has been fully performed, and a final application for payment has been submitted.

**V.60 CONTRACT-050.18 When Work Cannot Be Completed Through No Fault of Contractor (Oct 2006)**

When, upon final inspection, items of Work cannot be completed because of unseasonable considerations, such as bituminous paving, etc., or, if the Agency agrees that particular items need not be completed until a subsequent date, or, if the Agency delays the final Application for Payment for any unreasonable length of time, the Agency may agree to release payment to the Contractor, less one and one-half (1-1-2) times the dollar value of uncompleted parts of items of the type described in this subsection.

**V.61 CONTRACT-050.19 Final Payment Not Due Until Conditions Met (Oct 2006)**

Neither the final payment nor the remaining retained percentage becomes due until the Contractor submits to the Agency:

- (1) An affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Agency or its property might in any way be responsible, have been paid or otherwise satisfied;
- (2) Statements of surety and the Contractor's certificate on forms satisfactory to the Agency as to Contractor's payment of all claims for labor, materials, equipment rentals and public utility services; and
- (3) If required by the Agency, other data establishing payment or satisfaction of all such obligations, such as receipts, releases and waivers of liens arising out of the Agreement, to the extent and in such form as is designated by the Agency.

If any subcontractor refuses to furnish a release or waiver, as required by the Agency, the Contractor may furnish a bond satisfactory to the Agency to indemnify the Agency against any such lien. If any such lien remains unsatisfied after all payments are made, the Contractor shall refund to the Agency all moneys that the latter may be compelled to pay in discharging such liens, including all costs and reasonable attorney's fees.

**V.62 CONTRACT-050.20 Release of Funds Due to Delay in Final Inspection Not Due to the Fault of the Contractor (Oct 2006)**

If, after final inspection of the work, final completion is materially delayed through no fault of the Contractor, the Agency shall make payment of the balance due for that portion of the Work fully completed and accepted. Such payment will not terminate the Agreement. If the remaining balance of work not fully completed or corrected is less than the retainage stipulated in Section 8.10, and, if bonds have been furnished as required, the Contractor must submit to the Agency, prior to certification of the payment, the written consent of the surety to the payment of the balance due for that portion of the work fully completed and accepted. Such payment shall be made under the terms and conditions governing final payment, except that it does not constitute a waiver of any of the Agency's claims against the Contractor.

**V.63 CONTRACT-050.21 Final Payment as Waiver of Claims (Oct 2006)**

The making of final payment constitutes a waiver of all claims by the Agency, except those arising from:

- (1) Unsettled claims;
- (2) Faulty or defective work or material;
- (3) Failure of the work or material to comply with the requirements of the Contract Documents; or
- (4) Terms of any special guarantees required by the Contract Documents.

**V.64 CONTRACT-050.22 Acceptance of Final Payment as Waiver of Claims (Oct 2006)**

The acceptance of final payment by the Contractor constitutes a waiver of all claims by the Contractor.

**V.65 CONTRACT-050.23 Subcontractor/Supplier Agreement (Oct 2006)**

All Work performed for the Contractor by a subcontractor or supplier of materials shall be pursuant to an appropriate agreement between the Contractor and the subcontractor or supplier (and where appropriate between subcontractor and sub-subcontractors). The agreement must be a fully executed agreement and include the amount of subcontractor, sub-subcontractor or supplier is to be paid for the work to be performed or for the materials to be supplied.

**V.66 CONTRACT-050.24 No Contractual Relationship Between Agency and Subcontractor (Oct 2006)**

Nothing contained in the Contract Documents creates any contractual relation between the Agency and any subcontractor, sub-subcontractor or supplier.

**V.67 CONTRACT-050.25 Payment to Subcontractors (Oct 2006)**

Performance by a subcontractor in accordance with the provisions of the contract entitles the Subcontractor to payment from the party with which the Subcontractor has contracted. For purposes of this section, the contract between the Contractor and Subcontractor is presumed to incorporate the terms of the contract between the Contractor and the agency.

**V.68 CONTRACT-050.26 Contractor Disclosure of Due Date for Progress Payments From Agency (Oct 2006)**

The Contractor shall disclose to a subcontractor, before a subcontract is executed, the due date for receipt of progress payments from the Agency. If the Contractor fails to accurately disclose the due date to a subcontractor, the Contractor must pay the subcontractor as though the agency has paid the Contractor within forty-five (45) days of receipt of its application for payment. This section does not apply to a change in due dates because of conditions beyond the Contractor's control, including, but not limited to, design changes, change orders or delays in construction due to weather conditions.

**V.69 CONTRACT-050.27 Time for Subcontractor Payment (Oct 2006)**

When a subcontractor has performed in accordance with the provisions of the contract, the Contractor shall pay to the subcontractor, the full or proportional amount received for each subcontractor's work and material, based on work completed or services provided under the contract, within fourteen (14) days of receipt of a progress payment.

**V.70 CONTRACT-050.28 Interest on Subcontractor Payments (Oct 2006)**

If any progress payment is not made to a subcontractor by the due date the Contractor shall pay to the subcontractor, in addition to the amount due, interest as computed at the rate determined by the Secretary of Revenue for interest payments on overdue taxes or the refund of taxes as provided in Sections 806 and 806.1 of the Act of April 9, 1929 (P.L. 343, No. 176), known as "The Fiscal Code," and any subsequent amendments to those sections.

**V.71 CONTRACT-050.29 Deficiency Items (Oct 2006)**

The Contractor may withhold payment from any subcontractor responsible for a deficiency item. The Contractor shall pay any subcontractor according to the provisions of this section for any item which appears on the application for payment and which has been satisfactorily completed.

**V.72 CONTRACT-050.30 Notification of Deficiency Item (Dec 6 2006)**

If a Contractor withholds payment from a subcontractor for a deficiency item, it must notify the subcontractor or supplier and the contracting body of the reasons within 15 calendar days of the date after receipt of the notice of the deficiency item from the owner.

**V.73 CONTRACT-050.31 Failure of Agency to Make Progress Payment (Oct 2006)**

If the Agency fails to issue an approved Application for Payment for any cause which is the fault of the Contractor and not the fault of a particular subcontractor, the Contractor shall pay that subcontractor, upon demand made by the subcontractor at any time after the approved Application for Payment should otherwise have been issued, for its work to the extent completed, less the retained percentage.

**V.74 CONTRACT-050.32 Insurance Receipts (Oct 2006)**

The Contractor shall pay each subcontractor a just share of any insurance moneys received by the Contractor, and shall require each subcontractor to make similar payments to its sub-subcontractors.

**V.75 CONTRACT-050.33 Percentage of Completion (Oct 2006)**

The Agency may, on request, furnish to any subcontractor, if practicable, information regarding percentages of completion certified to the Contractor on account of work done by such subcontractor.

**V.76 CONTRACT-050.34 No Obligation on Part of Agency to Pay Subcontractor (Oct 2006)**

The Agency shall have no obligation to pay, or to see to the payment of, any moneys to any subcontractor except as may otherwise be required by law.

**V.77 CONTRACT-050.35 Subcontractor Responsibility (Oct 2006)**

If the Contractor enters into any agreements under this Contract with subcontractors or suppliers, which are currently suspended or debarred by the Commonwealth, or who become suspended or debarred by the Commonwealth during the term of this Contract or any extensions or renewals of it, the Agency may require the Contractor to terminate such contract.

**V.78 CONTRACT-050.36 Time of the Essence (Oct 2006)**

All time limits stated in the Purchase Order are of the essence.

**V.79 CONTRACT-050.37 Initial Job Conference (Oct 2006)**

The initial job conference will be held within thirty days from the Effective Date of the Purchase Order.

**V.80 CONTRACT-050.38 Construction and Installation Schedule (Oct 2006)**

Construction and equipment installation shall proceed in accordance with the Construction and Installation schedule approved by Agency and attached to the Purchase Order.

**V.81 CONTRACT-050.39 Delays and Extensions of Time (Oct 2006)**

If the Contractor is delayed at any time in the progress of the Work by any act or neglect of the Agency or by any Agency employee or by changes ordered in the Work, by labor disputes, fire, unavoidable casualties, or by delay due to suspension of Work, or by any cause that the Agency determines may justify the delay, then the time may be extended, by the approval of the Agency, of an extension of time for such reasonable time as the Agency may determine. The Agency will respond to the request for Extension of Time within twenty (20) days of its receipt.

**V.82 CONTRACT-050.40 Requests for Extensions of Time (Oct 2006)**

All requests for extensions of time shall be made to the Agency in writing. All such requests must be filed within ten days of the end of the event or issue, which caused the alleged delay.

**V.83 CONTRACT-050.41 Construction and Equipment Installation (Oct 2006)**

- a. The Contractor shall be responsible for the professional and technical accuracy, of all construction and services performed in the installation of the HVAC & Exhaust Replacement, whether by the Contractor or its subcontractors or others on its behalf, throughout the term of this Contract.
- b. The Contractor shall provide overall coordination, management, and responsibility, and shall assure that all Work is completed in a good and workmanlike manner. Subject to other provisions of this Contract, the Contractor will act as a turn-key general contractor assuming total responsibility for the procurement of labor and material for installation and start-up of the HVAC & Exhaust Replacement, including: selecting subcontractors; awarding subcontracts; receiving and evaluating submitted drawings on the equipment; progress inspections during installation; developing and presenting subcontractor punch lists after each inspection; receiving and evaluating record drawings; and operation and maintenance manuals from subcontractors; providing for training of Agency personnel on proper operation of the newly installed HVAC & Exhaust Replacement ; and final inspection and recommendation for approval to the Agency for acceptance of the HVAC & Exhaust Replacement
- c. The Contractor shall conduct a thorough and systematic performance test of each element and total system of the installed HVAC & Exhaust Replacement prior to acceptance of the HVAC & Exhaust Replacement by Agency. The Contractor shall provide notice to the Agency of the scheduled test(s) and the Agency and/or its designees shall have the right to be present at any or all such tests conducted by the Contractor and/or manufacturers of the equipment. The Contractor shall be responsible for correcting and/or adjusting all deficiencies in systems and equipment operations that may be observed during performance testing.

**V.84 CONTRACT-050.42 Permits and Approvals (Oct 2009)**

The Contractor shall be responsible for obtaining all necessary permits and approvals for completion of the project and shall pay any and all permit fees. Agency shall use its best efforts to assist the Contractor in obtaining all necessary permits and approvals. In no event shall Agency be directly responsible for payment of any permit fees. The Contractor shall furnish copies of each permit or license which is required to perform the work to the Agency before the Contractor commences the portion of the work requiring such permit or license.

**V.85 CONTRACT-050.43 Coordination During Installation (Oct 2006)**

The Agency and the Contractor shall coordinate the activities of the Contractor's equipment installers with those of the Agency, its employees, and agents. The Contractor shall not commit or permit any act which will interfere with the performance of business activities conducted by the Agency or its employees without prior written approval of the Agency.

**V.86 CONTRACT-050.44 Performance by the Contractor (March 5, 2007)**

The Contractor shall perform all tasks/phases under the Contract, including construction, and install the equipment or system] in such a manner so as not to harm the structural integrity of the buildings or their operating systems. The Contractor shall repair and restore to its original condition any area of damage caused by the Contractor's performance under this Contract. The Agency reserves the right to review the Work performed by the Contractor and to direct the Contractor to take certain corrective action if, in the opinion of the Agency, the structural integrity

of the Premises or its operating system is or will be harmed. All costs associated with such corrective action to damage caused by the Contractor's performance of the work shall be borne by the Contractor.

The Contractor shall remain responsible for the professional and technical accuracy of all services performed, whether by the Contractor or its subcontractors or others on its behalf, throughout the term of this Contract. The Contractor is responsible for general broom cleaning at cost. At least once a week, the Contractor shall remove from the Premises all discarded material and rubbish resulting from the work and assure the Premises are free of such materials and rubbish.

**V.87 CONTRACT-050.45 Prevailing Minimum Wages (Oct 2009)**

The contract with the awarded vendor is subject to and shall comply with the provisions, duties, obligations, remedies and penalties of the Pennsylvania Prevailing Wage Act, 43 P.S. Sections 165-1 through 165-17 and its regulations 34 Pa. Code Sections 9.101 through 9.112, which are incorporated herein by reference as if fully set forth herein. The contractor shall pay no less than the wage rates including contributions for employee benefits as determined by the Secretary of Labor and Industry (hereinafter referred to in this paragraph as "Secretary") for each craft or classification of all workers needed to perform this contract during the term hereof for the county in which the work is to be performed. In compliance with said Pennsylvania Prevailing Wage Act, the Prevailing Minimum Wage Predetermination, as approved by the Secretary, is attached hereto and made a part hereof.

A. The provisions of this paragraph shall apply to all work performed on the contract by the contractor and to all work performed on the contract by all subcontractors. The contractor shall insert in each of its subcontracts all of these required contract provisions and stipulations contained in this paragraph and such other stipulations as may be required.

B. No worker may be employed on the public work except in accordance with the classifications set forth in the decisions of the Secretary. In the event that additional or different classifications are necessary, the procedure set forth in section 8 of the Act (43 P.S. § 165-8) and section 9.107 of the Act's Regulations (relating to petition for review of rates and hearings) shall be followed.

C. Workers employed or working on the public work shall be paid unconditionally, regardless of whether any contractual relationship exists or the nature of a contractually relationship which may be alleged to exist between a contractor, subcontractor and workers, at least once a week without deduction or rebate, on any account, either directly or indirectly, except authorized deductions, the full amounts due at the time of payment, computed at the rates applicable to the time worked in the appropriate classification. Nothing in the contract, the Prevailing Wage Act or its Regulations prohibits the payment of more than the general prevailing minimum wage rates as determined by the Secretary to any worker or public work.

D. The contractor and each subcontractor shall post for the entire period of construction the wage determination decisions of the Secretary, including the effective date of changes thereof, in a prominent and easily accessible place or places at the site of the work and at the place or places used by them to pay workers their wages. The posted notice of wage rates shall contain the following information:

1. The name of project.
2. The name of public body for which it is being constructed.
3. The crafts and classifications of workers listed in the Secretary's general prevailing minimum wage rate determination for the particular project.
4. The general prevailing minimum wage rates determined for each craft and classification and the effective date of changes.
5. A statement advising workers that if they have been paid less than the general prevailing minimum wage rate for their job classification or that the contractor or subcontractor are not complying with the act or the regulations in any manner whatsoever, the worker may file a protest in writing with the Secretary of Labor and Industry within 3 months of the date of the occurrence, objecting to the payment to a contractor to the extent of the amount due or to become due to them as wages for work performed on the public work project. A worker paid less than the rate specified in the contract shall have a civil right of action for the difference between the wage paid

and the wages stipulated in the contract, which right of action must be exercised within 6 months from the occurrence of the event creating the right.

E. The contractor and subcontractors shall keep an accurate record showing the name, craft or classification, number of hours worked per day, and the actual hourly rate of wage paid including employee benefits, to each worker employed by the contractor or subcontractor in connection with the public work. The record shall include deductions from each worker. The record shall be preserved for 2 years from the date of payment and shall be open at reasonable hours to the inspection of the public body awarding the contract and to the Secretary or the Secretary's authorized representatives.

F. Apprentices shall be limited to numbers in accordance with a bona fide apprenticeship program registered with and approved by the Pennsylvania Apprenticeship and Training Council and only apprentices whose training and employment are in full compliance with The Apprenticeship and Training Act (43 P.S. §§ 90.1 – 90.10), approved July 14, 1961 and the regulations issued thereto shall be employed on the public work project. A worker using the tools of a craft who does not qualify as an apprentice within the provisions of this subsection shall be paid the rate predetermined for journeymen in that particular craft or classification.

G. Wages shall be paid without deductions except authorized deductions. Employers not parties to a contract requiring contributions for employee benefits which the Secretary of Labor & Industry has determined to be included in the general prevailing minimum wage rate shall pay the monetary equivalent thereof directly to the workers.

H. Payment of compensation to workers for work performed on public work on a lump sum basis, or a piece work system, or a price certain for the completion of a certain amount of work, or the production of a certain result shall be deemed a violation of the Act, regardless of the average hourly earnings resulting therefrom.

I. Each contractor and each subcontractor shall file a statement each week and a final statement at the conclusion of the work on the contract with the contracting agency, under oath, and in form satisfactory to the Secretary, certifying that workers have been paid wages in strict conformity with the provisions of the contract. If wages remain unpaid, the contractor or subcontractor shall set forth the amount of wages due and owing to each worker respectively. A copy of the form entitled "Contractor's or Subcontractor's Weekly Payroll Certification for Public Works Projects" is attached hereto.

J. Before final payment is made, a final wage certification must be submitted by all contractors and subcontractors.

#### **V.88 CONTRACT-051.1 Notice (Dec 2006)**

Any written notice to any party under this Contract shall be deemed sufficient if delivered personally, or by facsimile, teletype, electronic or digital transmission (provided such delivery is confirmed), or by a recognized overnight courier service (e.g., DHL, Federal Express, etc.) with confirmed receipt, or by certified or registered United States mail, postage prepaid, return receipt requested, and sent to following:

- a. If to the Contractor: the Contractor's address as recorded in the Commonwealth's Supplier Registration system.
- b. If to the Commonwealth: the address of the Issuing Office as set forth on the Contract.

#### **V.89 CONTRACT-052.1 Right to Know Law (Feb 2010)**

a. The Pennsylvania Right-to-Know Law, 65 P.S. §§ 67.101-3104, ("RTKL") applies to this Contract. For the purpose of these provisions, the term "the Commonwealth" shall refer to the contracting Commonwealth agency.

b. If the Commonwealth needs the Contractor's assistance in any matter arising out of the RTKL related to this Contract, it shall notify the Contractor using the legal contact information provided in this Contract. The Contractor, at any time, may designate a different contact for such purpose upon reasonable prior written notice to the Commonwealth.

c. Upon written notification from the Commonwealth that it requires the Contractor's assistance in responding to a



request under the RTKL for information related to this Contract that may be in the Contractor's possession, constituting, or alleged to constitute, a public record in accordance with the RTKL ("Requested Information"), the Contractor shall:

1. Provide the Commonwealth, within ten (10) calendar days after receipt of written notification, access to, and copies of, any document or information in the Contractor's possession arising out of this Contract that the Commonwealth reasonably believes is Requested Information and may be a public record under the RTKL; and
2. Provide such other assistance as the Commonwealth may reasonably request, in order to comply with the RTKL with respect to this Contract.

d. If the Contractor considers the Requested Information to include a request for a Trade Secret or Confidential Proprietary Information, as those terms are defined by the RTKL, or other information that the Contractor considers exempt from production under the RTKL, the Contractor must notify the Commonwealth and provide, within seven (7) calendar days of receiving the written notification, a written statement signed by a representative of the Contractor explaining why the requested material is exempt from public disclosure under the RTKL.

e. The Commonwealth will rely upon the written statement from the Contractor in denying a RTKL request for the Requested Information unless the Commonwealth determines that the Requested Information is clearly not protected from disclosure under the RTKL. Should the Commonwealth determine that the Requested Information is clearly not exempt from disclosure, the Contractor shall provide the Requested Information within five (5) business days of receipt of written notification of the Commonwealth's determination.

f. If the Contractor fails to provide the Requested Information within the time period required by these provisions, the Contractor shall indemnify and hold the Commonwealth harmless for any damages, penalties, costs, detriment or harm that the Commonwealth may incur as a result of the Contractor's failure, including any statutory damages assessed against the Commonwealth.

g. The Commonwealth will reimburse the Contractor for any costs associated with complying with these provisions only to the extent allowed under the fee schedule established by the Office of Open Records or as otherwise provided by the RTKL if the fee schedule is inapplicable.

h. The Contractor may file a legal challenge to any Commonwealth decision to release a record to the public with the Office of Open Records, or in the Pennsylvania Courts, however, the Contractor shall indemnify the Commonwealth for any legal expenses incurred by the Commonwealth as a result of such a challenge and shall hold the Commonwealth harmless for any damages, penalties, costs, detriment or harm that the Commonwealth may incur as a result of the Contractor's failure, including any statutory damages assessed against the Commonwealth, regardless of the outcome of such legal challenge. As between the parties, the Contractor agrees to waive all rights or remedies that may be available to it as a result of the Commonwealth's disclosure of Requested Information pursuant to the RTKL.

i. The Contractor's duties relating to the RTKL are continuing duties that survive the expiration of this Contract and shall continue as long as the Contractor has Requested Information in its possession.

#### **V.90 CONTRACT-053.1 Enhanced Minimum Wage Provisions (July 2016)**

**1. Enhanced Minimum Wage.** Contractor/Lessor agrees to pay no less than \$10.15 per hour to its employees for all the hours worked directly performing the services called for in this Contract/Lease, and for an employee's hours performing ancillary services necessary for the performance of the contracted services or lease when such employee spends at least twenty per cent (20%) of their time performing ancillary services in a given work week.

**2. Adjustment.** Beginning January 1, 2017, and annually thereafter, Contractor/Lessor shall pay its employees described in Paragraph 1. above an amount that is no less than the amount previously in effect; increased from such amount by the annual percentage increase in the Consumer Price Index for Urban Wage Earners and Clerical Workers (United States city average, all items, not seasonally adjusted), or its successor publication as determined by the United States Bureau of Labor Statistics; and rounded to the nearest multiple of \$0.05. The applicable adjusted amount shall be published in the Pennsylvania Bulletin by March 1 of each year to be effective the following July 1.

**3. Exceptions.** These Enhanced Minimum Wage Provisions shall not apply to employees:

- a. exempt from the minimum wage under the Minimum Wage Act of 1968;
  - b. covered by a collective bargaining agreement;
  - c. required to be paid a higher wage under another state or federal law governing the services, including the Prevailing Wage Act and Davis-Bacon Act; or
  - d. required to be paid a higher wage under any state or local policy or ordinance.
4. **Notice.** Contractor/Lessor shall post these Enhanced Minimum Wage Provisions for the entire period of the contract conspicuously in easily-accessible and well-lighted places customarily frequented by employees at or near where the contracted services are performed.
5. **Records.** Contractor/Lessor must maintain and, upon request and within the time periods requested by the Commonwealth, furnish all employment and wage records necessary to document compliance with these Enhanced Minimum Wage Provisions.
6. **Sanctions.** Failure to comply with these Enhanced Minimum Wage Provisions may result in the imposition of sanctions, which may include, but shall not be limited to, termination of the contract or lease, nonpayment, debarment or referral to the Office of General Counsel for appropriate civil or criminal referral.
7. **Subcontractors.** Contractor/Lessor shall include the provisions of these Enhanced Minimum Wage Provisions in every subcontract so that these provisions will be binding upon each subcontractor.