

**SPECIFICATIONS AND CONTRACT DOCUMENTS  
FOR  
JOB#: BC-2024-01**

**RE-BID: 2024 BUILDING RENOVATIONS,**

**CITY OF ALEXANDRIA SWAT BUILDING**

**OWNER: CITY OF ALEXANDRIA, LOUISIANA**



**PREPARED BY:  
Braddock Companies, LLC  
4024 Jackson Street  
Alexandria, Louisiana 71303  
Telephone: (318) 704-4393  
info@braddockcompanies.com**

**DECEMBER 2024**

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**ADVERTISEMENT FOR BIDS**  
**JOB# BC2024-01**  
**RE-BID: 2024 BUILDING RENOVATIONS, CITY OF ALEXANDRIA, SWAT BUILDING**

The City of Alexandria will receive separate sealed bids for the **RE-BID: 2024 BUILDING RENOVATIONS, CITY OF ALEXANDRIA, SWAT BUILDING** project in the City Council Meeting Chambers, City Hall, 915 3rd St. in Alexandria, LA **until 10:00a.m., TUESDAY, DECEMBER 10<sup>TH</sup>, 2024**, and then publicly opened and read aloud.

The Instructions to Bidders, Bid Form, Agreement between Owner and Contractor, Forms of Bid Bond, Performance Bond and Payment Bonds, Drawings and Specifications, and other Contract Documents may be examined, and copies obtained for \$200.00 per paper set or a disc of electronic documents in PDF form may be obtained for \$5.00, or the electronic PDF documents may be emailed for \$0.00 at the following location, pending email conformation of interested and approved entities. All emails will be screened. All bidders MUST be registered with the Architect.

**BRADDOCK COMPANIES, LLC**

4024 Jackson Street, Alexandria, LA 71303 (318) 704-4393, info@braddockcompanies.com  
Please call the office prior to visiting and identify the project for which you wish to receive documents.

A **MANDATORY PRE-BID MEETING** will take place @ **10:00A.M., THURSDAY, NOVEMBER 21<sup>ST</sup>, 2024**, at the job site, **1237 Texas Avenue, Alexandria, Louisiana, 71301**. ATTENDANCE IS MANDATORY.

All bids must be accompanied by bid security equal to five percent (5%) of the sum of the Base Bid, and must be in the form of a Bid Bond written by a surety or insurance company complying with R.S. 38:2218 C. The Bid Bond shall be in the favor of the Owner and shall be accompanied by appropriate power of attorney. The successful Bidder shall be required to furnish a Performance Bond and Payment Bond, in an amount equal to 100% of the Contract amount, written by a surety or insurance company meeting the requirements noted in R.S. 38:2219 A. (1)(a), (b) and (c).

The Owner reserves the right to reject any and all bids for just cause. In accordance with R.S. 38:2212 (A) (1)(b), the provisions and requirements of this Section, and those stated in the Advertisement for Bids, and those required on the Bid Form shall not be considered as informalities and shall not be waived.

No bid may be withdrawn for a period of forty-five (45) days after receipt of bids, except under the provisions of R.S. 38:2214. As a requirement under Louisiana Revised Statutes 37:2163, this project is classified as "Building Construction."

Pursuant to Louisiana Revised Statutes 38:2212(A)(1)(F) and 38:2212.1(B)(4), vendors/contractors now have the option to submit their bids and bid bonds, electronically. To submit or view bids, download, and receive bid notices by email, your company/agency will need to register with Central Bidding at [centrallauctionhouse.com](http://centrallauctionhouse.com). If you need help registering or completing an e-bid, please call (225) 810-4814.

The OWNER reserves the right to waive any informalities or to reject any or all bids. Each bidder must deposit with his bid, security in the amount, form and subject to the conditions provided in the Instructions to Bidders.

Primary contractor classification: specialty – **Building Construction**: All contractors must be licensed in the State of Louisiana.

No bidder may withdraw his Bid within forty-five (45) days after the actual date of the opening thereof.

**Address for Postal Delivery:**

CITY CLERK  
P.O. BOX 71  
ALEXANDRIA, LA  
71309-0071

**Address for Courier or  
Overnight Delivery:**

CITY CLERK  
915 THIRD STREET  
ALEXANDRIA, LA 71301  
PHONE: 318-449-5047

**Address for Electronic  
Submission:**

[www.centrallauctionhouse.com](http://www.centrallauctionhouse.com)  
[www.cityofalexandrialala.com](http://www.cityofalexandrialala.com)

PLEASE PUBLISH THREE (3) TIMES ON: **November 8, November 15, & November 22, 2024**

## INFORMATION TO BIDDERS

- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. Defined Terms</li> <li>2. Copies of Bidding Documents</li> <li>3. Qualifications of Bidders</li> <li>4. Date and Location of Receipt of Bids</li> <li>5. Interpretation and ADDENDA</li> <li>6. CONTRACT Time</li> <li>7. Liquidated Damages</li> </ol> | <ol style="list-style-type: none"> <li>8. Substitute or "Or Equal" Items</li> <li>9. Subcontractors, Suppliers and Others</li> <li>10. BID Proposal</li> <li>11. Bids to Remain Subject to Acceptance</li> <li>12. Retainage</li> <li>13. Performance and Payment Bonds</li> <li>14. Project Classification</li> </ol> |
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### **1. Defined Terms:**

- 1.1.1 Terms used in these Instructions to Bidders which are defined in the Standard General Provisions of the Construction CONTRACT have the meanings assigned to them in the General Provisions. The term "Bidder" means one who submits a BID directly to OWNER, as distinct from a sub-bidder who submits a BID to a BIDDER. The term "Successful BIDDER" means the lowest, qualified, responsible and responsive BIDDER to whom the OWNER (on the basis of OWNER'S EVALUAION AS HEREINAFTER PROVIDED) makes an award. The term "Bidding Documents" includes the Advertisement, Instructions to Bidders, the BID Form and the proposed CONTRACT Documents (including all ADDENDA issued prior to the receipt of Bids).

### **2. Copies of Bidding Documents:**

- 2.1 Complete sets of the Bidding Documents may be obtained from the ARCHITECT (info@braddockcompanies.com) or Central Bidding (www.centralbidding.com).
- 2.2 Complete sets of Bidding Documents must be used in preparing Bids; OWNER assumes no responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- ~~2.3 The City of Alexandria Standard Specifications for Street, Drainage and Utility Construction, 2013 Edition, is incorporated by Reference as part of the Bid Documents. Any changes to these Standard Specifications shall be included in the Supplemental Conditions. These Standard Specifications may be obtained on compact disc from the Office of the City Engineer, 625 Murray Street, Second Floor, Alexandria, LA 71301 or online at [www.cityofalexandria.com/rfp](http://www.cityofalexandria.com/rfp).~~
- 2.4 OWNER, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids on the WORK and do not confer a license or grant for any other use.

### **3. Qualifications of Bidders:**

- 3.1 To demonstrate qualification to perform the WORK, each BIDDER must be prepared to submit within five days of OWNER'S request for written evidence, such as financial data, previous experience, present commitments, and other such data as may be called for in the Supplementary Conditions. Each BID must contain evidence of Bidder's qualifications to do business in the state where the PROJECT is located or covenant to obtain such qualifications prior to award of the CONTRACT.

**4. Date and Location for Receipt of Bids:**

- 4.1 Bids for this PROJECT shall be received no later than **10:00 A.M. on Tuesday, December 10<sup>th</sup>, 2024**, in the City Council Chambers, 915 3rd St, Alexandria, LA 71301, where they will be publicly opened and read aloud.

**5. Interpretations and ADDENDA:**

- 5.1 All questions about the meaning or intent of the CONTRACT Documents are to be directed to the ARCHITECT. Interpretations or clarifications considered necessary by ARCHITECT in response to such questions will be issued by ADDENDA posted, mailed, emailed, or delivered to all parties recorded by ARCHITECT as having received the Bidding Documents. Questions received less than seven days prior to the date for opening Bids may not be answered. Only questions answered by formal written ADDENDA will be binding. Oral and other interpretations or clarifications will be held without legal effect.
- 5.2 ADDENDA may also be issued to modify the Bidding Documents as deemed advisable by OWNER or ARCHITECT.

**6. CONTRACT Time:**

- 6.1 The numbers of days within which, or dates by which, the WORK is to be substantially completed and ready for final payment (the CONTRACT Time) is **two hundred seventy (270) calendar days**.

**7. Liquidated Damages:**

- 7.1 Provisions for liquidated damages are set forth in the BID and under Section 10.5 of the General Provisions.

**8. Substitute or "Or Equal" Items:**

- 8.1 The CONTRACT, if awarded, will be on the basis of materials and equipment described in the Drawings or specified in the SPECIFICATIONS without consideration of possible substitute or "or equal" items. Whenever it is indicated in the Drawings or specified in the SPECIFICATIONS that a substitute or "or equal" item of material or equipment may be furnished or used by CONTRACTOR, if acceptable to ARCHITECT, application for such acceptance will not be considered by ARCHITECT until after the Effective Date of the CONTRACT. The procedure for submission of any such application by CONTRACTOR and consideration by ARCHITECT is set forth in Paragraph 7.9 of the General Provisions and as may be amended in the SPECIAL PROVISIONS.

**9. Subcontractors, Suppliers, and Others:**

- 9.1 No CONTRACTOR shall be required to employ any SUBCONTRACTOR, Supplier, other person, or organization against whom CONTRACTOR has reasonable objection.

**10. BID FORM:**

- 10.1 The BID FORM is included with the Bidding Documents.

- 10.2 Bids by corporations must be executed in the corporate name by the president or vice-president (or other corporate officer accompanied by evidence of authority to sign), and the corporate seal must be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation must be shown above the signature.
- 10.3 Bids by partnerships must be executed in the partnership name and signed by a partner, whose title must appear under the signature and the official address of the partnership must be shown below the signature.
- 10.4 All names must be typed or printed below the signature.
- 10.5 All ADDENDA shall be acknowledged on the Louisiana Uniform Public Work Bid Form.

**11. Bids to Remain Subject to Acceptance:**

- 11.1 All bids will remain subject to acceptance for forty-five days after the day of the BID opening, but OWNER may, at its sole discretion, release any BID and return the BID security prior to that date.

**12. Retainage:**

- 12.1 Retainage in the value as stipulated per LA Revised Statutes 38:2248 of the work completed and materials stored on-site shall be deducted from the CONTRACTOR'S Partial Payments.

**13. Performance and Payment Bonds:**

- 13.1 For public contracts of \$30,000.00 or less the CONTRACTOR may provide an irrevocable Letter of Credit from a commercial bank having offices in the City of Alexandria in an amount not less than the amount of the contract for the faithful performance of his duties in lieu of providing a Performance and Payment Bond. An irrevocable letter of credit will be accepted by a CONTRACTOR who meets the following criteria:

- (1) Meets the definition or requirements of a "responsible Bidder" as set forth in L.S.A.R.S. 38:2216(C-2); and
- (2) Has been operating as the same business for a continuous period of at least three (3) years.

**14. Project Classification: This PROJECT is classified as a **General Construction****



# LOUISIANA UNIFORM PUBLIC WORK BID FORM

TO: **City Council Clerk**  
**City Council Office, 1<sup>st</sup> Floor City Hall**  
**915 Third Street, Alexandria, LA 71301**

BID FOR: **Job# BC2024-01**  
**RE-BID: 2024 Building Renovations, City of**  
**Alexandria SWAT Building**

The undersigned bidder hereby declares and represents that she/he; a) has carefully examined and understands the Bidding Documents, b) has not received, relied on, or based his bid on any verbal instructions contrary to the Bidding Documents or any addenda, c) has personally inspected and is familiar with the project site, and hereby proposes to provide all labor, materials, tools, appliances and facilities as required to perform, in a workmanlike manner, all work and services for the construction and completion of the referenced project, all in strict accordance with the Bidding Documents prepared by: **Braddock Companies, LLC.** and dated: **December 2024.**

Bidders must acknowledge all addenda. The Bidder acknowledges receipt of the following **ADDENDA:** (Enter the number the Designer has assigned to each of the addenda that the Bidder is acknowledging) \_\_\_\_\_.

**TOTAL BASE BID:** For all work required by the Bidding Documents (including any and all unit prices designated "Base Bid" \* but not alternates) the sum of:  
\_\_\_\_\_ Dollars (\$ \_\_\_\_\_)

**ALTERNATES:** For any and all work required by the Bidding Documents for Alternates including any and all unit prices designated as alternates in the unit price description.

**Alternate No. 1** (*Not Applicable*) for the lump sum of:  
\_\_\_\_\_ Dollars (\$ *Not Applicable*)

**Alternate No. 2** (*Not Applicable.*) for the lump sum of:  
\_\_\_\_\_ Dollars (\$ *Not Applicable*)

**Alternate No. 3** (*Not Applicable.*) for the lump sum of:  
\_\_\_\_\_ Dollars (\$ *Not Applicable*)

**NAME OF BIDDER:** \_\_\_\_\_

**ADDRESS OF BIDDER:** \_\_\_\_\_

**LOUISIANA CONTRACTOR'S LICENSE NUMBER:** \_\_\_\_\_

**NAME OF AUTHORIZED SIGNATORY OF BIDDER:** \_\_\_\_\_

**TITLE OF AUTHORIZED SIGNATORY OF BIDDER:** \_\_\_\_\_

**SIGNATURE OF AUTHORIZED SIGNATORY OF BIDDER \*\*:** \_\_\_\_\_

**DATE:** \_\_\_\_\_

\* The Unit Price Form shall be used if the contract includes unit prices. Otherwise, it is not required and need not be included with the form. The number of unit prices that may be included is not limited and additional sheets may be included if needed.

\*\* If someone other than a corporate officer signs for the Bidder/Contractor, a copy of a corporate resolution or other signature authorization shall be required for submission of bid. Failure to include a copy of the appropriate signature authorization, if required, may result in the rejection of the bid unless bidder has complied with La. R.S. 38:2212(B)5.

**BID SECURITY** in the form of a bid bond, certified check or cashier's check as prescribed by LA RS 38:2218.A is attached to and made a part of this Bid.

**APPENDIX A** is attached hereto and made a part of this Bid and shall be executed and submitted with the Bid Form.

**BID FORM APPENDIX A**

**BID DATE:**     10:00A.M., TUESDAY, DECEMBER 10, 2024

**COMPLETION TIME:** The Bidder hereby agrees to complete the Contract within **two hundred seventy(270) days** from the date of the Notice to Proceed, or within the time as may be extended by Change Order. The Work shall be considered complete only when the Owner shall have filed with the Office of the Recorder of Mortgages for the Parish in which the Work is located, its formal certificate of acceptance of the Work.

**LIQUIDATED DAMAGES:** The Bidder hereby also agrees, as a part consideration for this Contract, to pay the following sums per calendar day of Liquidated Damages, for such breach of Contract, if the Work is not completed within stipulated days: **Two Hundred Fifty Dollars (\$250.00) per calendar day.**

**REJECTION OF BIDS:** The Bidder understands that the Owner reserves the right to reject any or all bids and waive any informalities in the bidding.

**WITHDRAWAL OF BIDS:** The Bidder agrees that this Bid shall be good and may not be withdrawn for a period of thirty (30) calendar days after the scheduled closing for receiving bids except in accordance with the provisions of Act 111 of 1983. This Bid may be withdrawn at any time prior to the scheduled time for the opening of bids or any postponement thereof.

**PERFORMANCE BOND:** The Bidder hereby certifies that he has included in his proposal a sum sufficient to defray the cost of a 100% Performance and Material Payment Bond required by the Contract Documents, if declared the successful Bidder.

**AFFIDAVIT:** That the Owner comply with Legislative Act No. 38, State of Louisiana, it is understood that all contractors receiving value for services rendered for construction of this building shall execute an Affidavit attesting that said Public Contract was not secured through employment or payment of any solicitor.

**LICENSE CERTIFICATION:** The Bidder certifies that he/she meets all licensing requirements of this State and is duly and currently licensed under R.S. 37:2151-2163 of the State of Louisiana.

SIGNED and AGREED to on this \_\_\_\_ day of \_\_\_\_\_, 2024.

**BIDDER:** \_\_\_\_\_  
(signature)

**BY:** \_\_\_\_\_  
(printed)

**BID BOND**

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned,  
\_\_\_\_\_, as Principal, and \_\_\_\_\_,  
of \_\_\_\_\_, a corporation duly organized under the laws  
of the State of \_\_\_\_\_, as SURETY, are held and firmly bound unto the City of  
Alexandria, Louisiana, hereinafter called Obligee, in the penal sum of  
\_\_\_\_\_  
Dollars (\$\_\_\_\_\_), for the payment of which sum, well and truly to be made,  
the said Principal and the said SURETY, bind ourselves, our heirs, executors, administrators,  
successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a BID for the **RE-BID: 2024 BUILDING  
RENOVATIONS, CITY OF ALEXANDRIA, SWAT BUILDING.**

NOW THEREFORE,

- a. If said BID shall be rejected, or in the alternate,
  
- b. If said BID shall be accepted, and the Principal shall execute and deliver a CONTRACT in the form of CONTRACT attached hereto (properly completed in accordance with said BID) and shall furnish a BOND for his faithful performance of said CONTRACT, and for the payment of all persons performing labor or furnishing materials in connection therein, and shall in all other respects perform the agreement created by the same shall remain in force and effect; it being expressly understood and agree that the liability of the SURETY for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The SURETY, for value received, hereby stipulates and agrees that the obligations of said SURETY and its BOND shall be in no way impaired or affected by any extensions of the time within which the OWNER may accept such BID; and said SURETY does hereby waive notice of any such extension.

SIGNED AND SEALED THIS \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_ A.D.

(SEAL)

In presence of:

\_\_\_\_\_  
(Witness Signature)

\_\_\_\_\_  
(Principal Signature)

\_\_\_\_\_  
(Witness – printed name)

\_\_\_\_\_  
(Principal – printed name)

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

\_\_\_\_\_  
(Witness Signature)

\_\_\_\_\_  
(SURETY Signature)

\_\_\_\_\_  
(Witness – printed name)

\_\_\_\_\_  
(SURETY – printed name)

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

**NOTICE:** SURETY Companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state of Louisiana with a Louisiana established agent.

**ATTESTATION CLAUSE REQUIRED BY LA. R.S. 38.2227  
(PAST CRIMINAL CONVICTIONS OF BIDDERS)**

**Owner:** CITY OF ALEXANDRIA, LA

**Bidder:** \_\_\_\_\_

**Project:** RE-BID: 2024 BUILDING RENOVATIONS, CITY OF ALEXANDRIA SWAT BUILDING

**Bid Date:** TUESDAY, DECEMBER 10, 2024 @ 10:00 a.m.

Bidder on the above-entitled public project does hereby attest and certify that:

- A. If a sole proprietor, that he has not
  - (a) ever been convicted or, or entered a plea of guilty or nolo contendere to any of the crimes or equivalent federal crimes listed in Subsection C(1) below; and
  - (b) for a period of five years previous to the project bid date, been convicted of, or entered a plea of guilty or nolo contendere to any of the crimes or equivalent federal crimes listed on Subsection C(2) below during the solicitation or execution of a contract or bid awarded pursuant to the provisions of Chapter 10 of Title 38 of the Louisiana Revised Statues.
  
- B. If a partnership, corporation, joint venture, or limited liability company, that no individual partner, incorporator, director, manager, officer, organizer, or member, who has a minimum of a ten percent ownership in the bidding entity has
  - (a) ever been convicted or, or entered a plea of guilty or nolo contendere to any of the crimes or equivalent federal crimes listed in Subsection C(1) below; and
  - (b) for a period of five years previous to the project bid date, been convicted of, or entered a plea of guilty or nolo contendere to any of the crimes or equivalent federal crimes listed on Subsection C(2) below during the solicitation or execution of a contract or bid awarded pursuant to the provisions of Chapter 10 of Title 38 of the Louisiana Revised Statues.
  
- C. A conviction of or plea of guilty or nolo contendere to the following state crimes or equivalent federal crimes shall be permanently bar any person or the bidding entity from bidding on public projects:
  - (a) Public bribery (R.S.14:118)

- (b) Corrupt influencing (R.S. 14:120)
- (c) Extortion (R.S. 14:66)
- (d) Money laundering (R.S. 14:230)

D. A conviction of or guilty plea or nolo contendere to the following state crimes or equivalent federal crimes shall be bar any person or the bidding entity from bidding on public projects for a period of five years from the date of conviction or from the date of the entrance of the plea of guilty or nolo contendere:

- (a) Theft (R.S. 14:67)
- (b) Identity Theft (R.S. 14:67.16)
- (c) Theft of a business record (R.S. 14:67.20)
- (d) False accounting (R.S. 14:70)
- (e) Issuing worthless checks (R.S. 14:71)
- (f) Bank fraud (R.S. 14:71.1)
- (g) Forgery (R.S. 14:72)
- (h) Contractors; misapplication of payments (R.S. 14:202)
- (i) Malfeasance in office (R.S. 14:134)

Bidder hereby agrees that in the event that this attestation is found to be false and the project must be re-advertised or the contract canceled that bidder is responsible to the Owner for all costs associated with the rebidding, additional costs due to increased costs of bids and any and all delay costs due to the rebid or cancellation of the contract. Such obligation for payment shall be in addition to the forfeiture of the Bid Bond provided with the Contractor's proposal.

**Bidder:** \_\_\_\_\_

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

**By:** \_\_\_\_\_  
Authorized Signature

**Print Name:** \_\_\_\_\_  
Authorized Signatory of Bidder

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

**AFFIDAVIT REQUIRED BY LA. R.S. 38:2212.10 (VERIFICATION OF EMPLOYEES - E-VERIFY)**

**RE-BID: 2024 BUILDING RENOVATIONS CITY OF ALEXANDRIA SWAT BUILDING**

**JOB#: BC2024-01**

**OWNER: CITY OF ALEXANDRIA, LA**

Bidder on the above-entitled Public Works Project does hereby attest that:

**LA. R.S. 38:2212.10 VERIFICATION OF EMPLOYEES**

- (A) The Bidder is registered and participates in the status verification system (E-Verify) to verify that all employees in the State of Louisiana are legal citizens of the United States or are legal aliens.
- (B) If awarded the contract, Bidder shall continue, during the terms of the contract, to utilize the status verification system to verify that legal status of all new employees in the State of Louisiana.
- (C) If awarded the contract, Bidder shall require all subcontractors to submit to it a sworn affidavit verifying compliance with Paragraph (A) and (B) of this Attestation.

\_\_\_\_\_  
NAME OF BIDDER

\_\_\_\_\_  
NAME OF AUTHORIZED SIGNATORY OF BIDDER

\_\_\_\_\_  
DATE

\_\_\_\_\_  
TITLE OF AUTHORIZED SIGNATORY OF BIDDER

\_\_\_\_\_  
SIGNATURE OF AUTHORIZED SIGNATORY OF BIDDER

\_\_\_\_\_  
WITNESS

\_\_\_\_\_  
WITNESS

\_\_\_\_\_  
NOTARY PUBLIC

**NOTICE OF AWARD**

TO: \_\_\_\_\_ DATE:  
ADDRESS: \_\_\_\_\_  
\_\_\_\_\_

**PROJECT: JOB# BC2024-01 RE-BID: 2024 BUILDING RENOVATIONS, CITY OF ALEXANDRIA, SWAT BUILDING**

You are notified that your Bid dated \_\_\_\_\_ for the above Project has been considered. You are the apparent successful BIDDER and have been awarded a contract for your Base Bid of \_\_\_\_\_ (\$ \_\_\_\_\_) . Five (5) copies of the proposed Agreement accompany this Notice of Award.

You must comply with the following conditions precedent within ten (10) days of the date of this Notice of Award, that is by \_\_\_\_\_ :

1. You must deliver to the OWNER, FIVE (5) fully executed counterparts of the Agreement. If a corporation, include a durable power of attorney proving you are authorized to sign for said corporation.
2. You must deliver with the executed Agreement, the Contract Security (Bonds) as specified in Section 2 (Instructions to Bidders) and related Supplements, and Section 3 (Award and Execution of Contract) of the City of Alexandria’s Standard General Provisions.
3. You must deliver with the executed Agreement, the certificates of insurance coverage as specified in the City of Alexandria’s Standard General Provisions (Paragraph 6.1, 6.2, and 6.3) and as further specified in the Supplementary Provisions.

Failure to comply with these conditions within the time specified will entitle OWNER to consider your bid abandoned, to annul this Notice of Award and to declare your Bid Security or guaranty forfeited.

OWNER: CITY OF ALEXANDRIA, LOUISIANA

BY: \_\_\_\_\_

\_\_\_\_\_  
I have received the notification of award for the above referenced project.

\_\_\_\_\_  
Representative

\_\_\_\_\_  
Date

\_\_\_\_\_  
Authorized Company

After signing, please email at mike@braddockcompanies or fax to Mike Holt at (318) 704-6823.



**CONTRACT**

THIS CONTRACT AND AGREEMENT made and entered into by and between the CITY OF ALEXANDRIA, LOUISIANA, a municipal corporation herein represented by Jacques Roy, its Mayor, who is duly authorized by Ordinance No. \_\_\_\_\_, adopted by the City Council, on \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, hereinafter referred to as the OWNER; and \_\_\_\_\_ of the Parish of \_\_\_\_\_, State of Louisiana, hereinafter to as the CONTRACTOR.

**WITNESSETH:**

That the CONTRACTOR hereby agrees to complete the **RE-BID: 2024 BUILDING RENOVATIONS, CITY OF ALEXANDRIA, SWAT BUILDING** and to furnish all labor and materials therefore and perform all other WORK incidental to or connected therewith, as provided for in the DRAWINGS, SPECIFICATIONS, BID PROPOSAL, CONTRACT DOCUMENTS and according to the instructions of the ARCHITECT, and the laws applicable thereto.

Said CONTRACTOR further agrees to commence said WORK upon receipt of the NOTICE TO PROCEED issued by the ARCHITECT and to complete the same within the CONTRACT TIME as noted in the INFORMATION TO BIDDERS.

Said WORK to include the Base Bid and Bid Alternate Numbers \_\_\_\_\_ shall be done for and in consideration for the Sum of \_\_\_\_\_ DOLLARS (\$\_\_\_\_\_) in accordance with unit or lump sum prices as represented on the Bidder's proposal form attached hereto.

Payment will be made for the amount of WORK actually done at the unit or lump sum prices above fixed and all of the above-mentioned prices shall be considered as one entire consideration for the performance of one entire CONTRACT. The OWNER may order extra WORK or make changes by altering, adding, or deducting from the WORK, the CONTRACT sum being adjusted accordingly, provided that no extra WORK shall be authorized in excess of ten percent (10%) of the original BID without the written consent of the SURETY being first obtained. All of the WORK shall be paid for at the prices stipulated on the CONTRACT but no claims for any extra WORK or materials shall be allowed unless said extra WORK is ordered in writing by the ARCHITECT, acting officially for the OWNER and the cost is stated in such order.

The OWNER agrees that upon the final and satisfactory completion of the WORK called for by this CONTRACT, and any authorized additions or alterations thereto, shall accept the same by City Council action, and shall cause a copy of said acceptance to be filed for record in the office of the Recorder of Mortgages for the Parish of Rapides, State of Louisiana. Within thirty (30) days from the acceptance by the City Council, the OWNER will pay to the CONTRACTOR the final cost of the WORK, less retainage as set forth in LA Revised Statues 38:2248. Not less than forty-five (45) days after filing the formal acceptance of WORK with the Recorder of Mortgages, provided that all WORK done under the CONTRACT is at that time found to be in good condition insofar as the CONTRACTOR is responsible for it, the OWNER will pay the CONTRACTOR the retained portion of the CONTRACT PRICE, after deducting therefrom such sums as may be lawfully withheld under any of the provisions of this CONTRACT, the said payment being conditional on the CONTRACTOR furnishing to the OWNER a certificate from the Recorder of Mortgages for the Parish of Rapides that the CONTRACT is clear of any liens or privileges.

The DRAWINGS, SPECIFICATIONS and all documents listed in the BID covering said WORK are by reference made a part of this CONTRACT.

Any damage caused by the CONTRACTOR, his SUBCONTRACTOR(S), agent(s), or employees, to the OWNER'S property in connection with the WORK done under this CONTRACT shall be repaired at the expense of the CONTRACTOR, or proper adjustment made, before final payment to the CONTRACTOR if the amount due him hereunder.

THUS, DONE AND SIGNED AT ALEXANDRIA, LA, this \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, in the presence of the undersigned competent witnesses.

**CITY OF ALEXANDRIA:**

\_\_\_\_\_  
(Witness Signature)

\_\_\_\_\_  
The Honorable Jacques Roy, Mayor

\_\_\_\_\_  
(Witness – printed name)

\_\_\_\_\_  
(Witness Signature)

\_\_\_\_\_  
(Witness – printed name)

**CONTRACTOR:**

\_\_\_\_\_  
(Witness Signature)

\_\_\_\_\_  
(CONTRACTOR Signature)

\_\_\_\_\_  
(Witness – printed name)

\_\_\_\_\_  
(CONTRACTOR – printed name)

\_\_\_\_\_  
(Witness Signature)

\_\_\_\_\_  
(Witness – printed name)

**PERFORMANCE BOND**

KNOW ALL PERSONS BY THESE PRESENTS that \_\_\_\_\_  
\_\_\_\_\_ hereinafter called PRINCIPAL, and

\_\_\_\_\_  
(Insert the legal title of SURETY)

hereinafter called SURETY, are bound unto the City of Alexandria, Post Office Box 8555, Alexandria, Louisiana, hereinafter called OWNER, in the total aggregate penal sum of: \_\_\_\_\_ DOLLARS

(\$\_\_\_\_\_), for the payment of which sum will and truly be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the PRINCIPAL entered into a certain CONTRACT with the OWNER, dated the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, a copy of which is attached and made a part hereof for the construction of:

**BC-2024-01  
RE-BID: 2024 BUILDING RENOVATIONS, CITY OF ALEXANDRIA, SWAT BUILDING**

NOW THEREFORE, if the PRINCIPAL shall well, truly and faithfully perform its duties, all the undertakings, covenants terms, conditions and agreements of said CONTRACT during the original term thereof, and any extensions thereof which may be granted by the OWNER, with or without notice to the SURETY and during the one (1) year guaranty period and if the PRINCIPAL shall satisfy all claims and demands incurred under such CONTRACT, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be void, otherwise to remain in full force and effect.

PROVIDED, further, that the said SURETY, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the CONTRACT, or to WORK to be performed thereunder, or the SPECIFICATIONS accompanying same shall in any way affect its obligation of this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the CONTRACT or to the WORK or to the SPECIFICATIONS.

PROVIDED, further, that it is expressly agreed that the BOND shall be deemed amended automatically and immediately, without formal and separate amendments hereto, upon amendment to the CONTRACT not increasing the CONTRACT PRICE more than 10 percent (10%), so as to bind the PRICIPAL and the SURETY to the full and faithful performance of the CONTRACT BOND, and whether referring to this BOND, the CONTRACT DOCUMENTS shall include any alteration, addition, extension, or modification of any character whatsoever.

PROVIDED, further, that final settlement between the OWNER and the PRINCIPAL shall abridge the right of the other beneficiary hereunder, whose claim may be unsatisfied. The OWNER is the only beneficiary hereunder.

WITNESS WHEREOF, this instrument is executed in five (5) counterparts each one of which shall be deemed an original, this the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

(SEAL)

_____	_____
(Witness Signature)	(PRINCIPAL)
_____	BY: _____
(Witness – printed name)	(Principal signature)
	_____
	(Address)

(SEAL)

_____	_____
(Witness Signature)	(SURETY)
_____	BY: _____
(Witness – printed name)	(SURETY – printed name)
	_____
	(Address)

**NOTICE:** Date of BOND shall not be prior to date of CONTRACT. If CONTRACTOR is partnership, all partners shall execute BOND.

**PAYMENT BOND**

KNOW ALL PERSONS BY THESE PRESENTS that \_\_\_\_\_

Hereinafter called PRINCIPAL, and \_\_\_\_\_

\_\_\_\_\_  
(Insert the legal title of SURETY)

hereinafter called SURETY, are held bound unto the City of Alexandria, Louisiana, Post Office Box 8555, Alexandria, LA, hereafter called OWNER, and unto all persons, firms and corporations who or which may furnish labor, or who furnish materials to perform as described under the CONTRACT and to their successors and assigns in the total aggregate penal sum of: \_\_\_\_\_ DOLLARS (\$\_\_\_\_\_), in lawful money of the United States, for the payment of which sum will and truly be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the PRINCIPAL entered into a certain CONTRACT with the OWNER, dated the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, a copy of which is attached hereto and made a part hereof for the construction of:

**PROJECT #: BC-2024-01  
RE-BID: 2024 BUILDING RENOVATIONS CITY OF ALEXANDRIA SWAT BUILDING**

OWNER: CITY OF ALEXANDRIA, LOUISIANA NOW THEREFORE, id the PRINCIPAL shall promptly make payment to all persons, firms and corporation furnishing materials for or performing labor in the prosecution of the WORK provided for in such CONTRACT, and any authorized extensions or modifications thereof, including all amounts due for materials, lubricants, oils, gasoline, diesel, coal, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such WORK, and for labor cost incurred in such WORK including that by a SUBCONTRACTOR, and any mechanic or material man lien holder, whether it acquires its lien by operation of State or Federal Law; then this obligation shall be void, otherwise, to remain in full force and effect.

PROVDDED, that beneficiaries or claimants hereunder shall be limited to the SUBCONTRACTORS, and persons, firms, corporations having a direct CONTRACT and the PRINCIPAL OR ITS SUBCONTRACTORS.

PROVIDED, further, that the SURETY for valued received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the CONTRACT or to the WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any way affect this obligation on the BOND, and it does hereby waive notice of any such change, extensions of time, alteration or addition to the terms of this CONTRACT or to the WORK or to the SPECIFICATIONS.

PROVIDED, further, that no suit or action shall be commenced hereunder by any claimant: (a) unless claimant, other than one having a direct CONTRACT with the PRINCIPAL, shall have given written notice to any two (2) of the following:

The PRINCIPAL, the OWNER, or the SURETY above named, within ninety (90) days after such claimant did or performed the last of the WORK or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the WORK or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage paid, in an envelope addressed to the PRINCIPAL, OWNER, or SURETY, at any place where an office is regularly maintained for the transaction of business, or served in any manner which legal process may be served in the state in which the aforesaid project is located; save that such service need not be made by a public officer; (b) after

PRINCIPAL ceased work on said CONTRACT, it being understood, however, that if any limitation embodied in the BOND is prohibited by any law controlling the construction, such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

PROVIDED, further, that it is expressly agreed that this BOND shall be deemed automatically and immediately, without formal and separate amendments hereto, upon amendment to the CONTRACT not increasing the CONTRACT PRICE more than ten percent (10%), so as to bind the PRINCIPAL and the SURETY to the full and faithful performance of the CONTRACT as so amended. The "Amendment," wherever used in this BOND and whether referring to this BOND, the CONTRACT or the Loan DOCUMENTS shall include any alteration, addition, extension or modification of any character whatsoever.

PROVIDED, further, that no final settlement between the OWNER and PRINCIPAL shall abridge the right of any beneficiary hereunder, whose claim may be satisfied.

WITNESS WHEREOF, this instrument is executed in five (5) counterparts, each of which shall be deemed an original, this \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

(SEAL)

\_\_\_\_\_  
(PRINCIPAL)

\_\_\_\_\_  
(Witness Signature)

BY: \_\_\_\_\_  
(Principal signature)

\_\_\_\_\_  
(Witness – printed name)

\_\_\_\_\_  
(Address)

(SEAL)

\_\_\_\_\_  
(Witness Signature)

\_\_\_\_\_  
(SURETY)

\_\_\_\_\_  
(Witness – printed name)

BY: \_\_\_\_\_  
(SURETY – printed name)

\_\_\_\_\_  
(Address)

**NOTICE:** Date of BOND shall not be prior to date of CONTRACT. If CONTRACTOR is partnership, all partners shall execute BOND.

**CONTRACTOR'S AFFIDAVIT**

**STATE OF LOUISIANA**

**PARISH OF RAPIDES**

BEFORE ME, the undersigned Notary Public, personally came and appeared herein represented by \_\_\_\_\_, who after being duly sworn by me did depose and say:

That \_\_\_\_\_ has been selected by the CITY OF ALEXANDRIA, LOUISIANA, as Contractor and apparent low bidder for the construction of:

**Job# BC2024-01**  
**RE-BID: 2024 Building Renovations, City of Alexandria Swat Building**

And that he/she does hereby certify, in compliance with Louisiana Revised Statutes Section 38:2224:

1. That he/she employed no person, corporation, firm, association, or other organization either directly or indirectly, to secure the contract for the above- mentioned public project, other than persons regularly employed by him whose services in connection with the construction, of said public project or in securing the contract for same were in the regular course of their duties for him; and
2. That no part of the Contract price received, or to be received, by him was paid or will be paid to any person, corporation, firm, association, or other organization, for soliciting the Contract, other than the payment of their normal compensation to persons regularly employed by him, whose services in connection with the construction of said public project, were in the regular course of their duties for him.

\_\_\_\_\_  
(Witness Signature)

BY: \_\_\_\_\_  
Signature of Contractor

\_\_\_\_\_  
(Witness – printed name)

\_\_\_\_\_  
(Witness Signature)

\_\_\_\_\_  
(Witness – printed name)

THUS, SWORN BEFORE ME, this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_ A.D.

(Signature)	(Printed Name) NOTARY PUBLIC	(License No.)
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**NOTICE TO PROCEED**

DATE: \_\_\_\_\_  
TO: \_\_\_\_\_

**JOB# BC2024-01**

**RE-BID: 2024 Building Renovations, City of Alexandria, Swat Building**

You are hereby notified to commence WORK on the above-named project in accordance with the CONTRACT dated \_\_\_\_\_ on or before \_\_\_\_\_, 20\_\_\_\_. Said WORK shall be complete within \_\_\_\_\_ (\_\_\_\_) working days thereafter. The date of completion of all work is therefore \_\_\_\_\_, 20\_\_\_\_.

City of Alexandria – OWNER

BY: \_\_\_\_\_

**ACCEPTANCE OF NOTICE**

*Construction Company Name*

BY: \_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Printed name)

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

\_\_\_\_\_  
(Date)



DIVISION 1

General Provisions

Section 1

Definition of Terms

1.1 STATE	1.27 FIELD ORDER
1.2 PARISH	1.28 HAZARDOUS WASTE
1.3 CITY	1.29 LAWS AND REGULATIONS
1.4 COUNCIL	1.30 LABORATORY
1.5 MAYOR	1.31 LIENS
1.6 DIRECTOR OF PUBLIC WORKS	1.32 NOTICE OF AWARD
1.7 DESIGN PROFESSIONAL	1.33 NOTICE TO PROCEED
1.8 ADDENDA	1.34 PARTIAL UTILIZATION
1.9 AGREEMENT	1.35 PLANS
1.10 APPLICATION FOR PAYMENT	1.36 PROJECT
1.11 ASBESTOS	1.37 PROJECT REPRESENTATIVE
1.12 BID	1.38 SAMPLES
1.13 BIDDER	1.39 SHOP DRAWINGS
1.14 BIDDING DOCUMENTS	1.40 SPECIAL PROVISIONS
1.15 BIDDING REQUIREMENT	1.41 SPECIFICATIONS
1.16 BONDS	1.42 SUBCONTRACTOR
1.17 CERTIFICATE OF ACCEPTANCE	1.43 SUPPLIER
1.18 CHANGE ORDER	1.44 UNDERGROUND FACILITIES
1.19 CONTRACT DOCUMENTS	1.45 UNIT PRICE WORK
1.20 CONTRACT PRICE	1.46 WORK
1.21 CONTRACT TIME	1.47 WORKING DAY
1.22 CONTRACTOR	1.48 WRITTEN AMENDMENT
1.23 CONTROLLING ITEMS OF WORK	1.49 DEFINITION OF ALPHABETICAL TERMS
1.24 DEFECTIVE	1.50 OR EQUAL
1.25 DRAWINGS	1.51 SUBSTANTIAL COMPLETION PUNCH LIST, LEIN PERIOD
1.26 EFFECTIVE DATE OF AGREEMENT	

Wherever used in these SPECIFICATIONS or CONTRACT DOCUMENTS, the following terms shall have the meaning indicated and shall be applicable to both the singular and plural thereof.

- 1.1 STATE: State of Louisiana.
- 1.2 PARISH: The Parish of Rapides.
- 1.3 CITY: The City of Alexandria, Louisiana, domiciled in Rapides Parish and governed by a Mayor-Council form of government represented by the MAYOR.
- 1.4 COUNCIL: The elected COUNCIL and governing body of CITY.
- 1.5 MAYOR: The MAYOR of the CITY.
- 1.6 DIRECTOR OF PUBLIC WORKS: The DIRECTOR OF PUBLIC WORKS of the CITY or his authorized representative.

- 1.7 DESIGN PROFESSIONAL: The person, firm, or corporation named as such in the AGREEMENT.
- 1.8 ADDENDA (ADDENDUM): Written or graphic instruments issued prior to the BID opening that modify or interpret the CONTRACT DOCUMENTS, PLANS, and SPECIFICATIONS, by additions, deletions, clarifications, or corrections.
- 1.9 AGREEMENT: The written Contract between the CITY and the CONTRACTOR concerning the work to be performed; other CONTRACT DOCUMENTS are attached to the AGREEMENT and made a part thereof as provided therein.
- 1.10 APPLICATION FOR PAYMENT: The form approved by the CITY to be used by the CONTRACTOR in requesting progress or final payments. The application may require supporting documentation as required in the CONTRACT DOCUMENTS or additionally by the CITY.
- 1.11 ASBESTOS: Any material that contains more than one percent ASBESTOS and is friable or is releasing ASBESTOS fibers into the air above current action levels established by the United State Occupational Safety and Health Administration.
- 1.12 BID: The written offer of the BIDDER to perform the contemplated WORK and furnish the necessary materials on the prescribed form, properly signed in accordance with Louisiana law.
- 1.13 BIDDER: Any individual, firm or corporation submitting a BID for the WORK contemplated, acting directly or through a duly authorized representative.
- 1.14 BIDDING DOCUMENTS: The Advertisement or Invitation to BID, Instruction(s) to BIDDERS, the BID form(s), and the proposed CONTRACT DOCUMENTS including ADDENDA or acknowledgment of ADDENDA issued prior to receipt of BID.
- 1.15 BIDDING REQUIREMENTS: The Advertisement or Invitation to BID, Instruction(s) to BIDDERS and the BID form(s), and applicable Louisiana law.
- 1.16 BONDS: BID, Performance and Payment BONDS and other instruments of security, furnished by the CONTRACTOR and the CONTRACTOR'S SURETY, in accordance with the BIDDING REQUIREMENTS and CONTRACT DOCUMENTS.
- 1.17 CERTIFICATE OF ACCEPTANCE: Document recommended by DESIGN PROFESSIONAL, executed by MAYOR at the direction of CITY COUNCIL indicating that all WORK has been completed in accordance with the CONTRACT DOCUMENTS.
- 1.18 CHANGE ORDER: A document recommended by the DESIGN PROFESSIONAL on an approved form signed by the CONTRACTOR and CITY and authorizing an addition, deletion or revision in the WORK or an adjustment in the CONTRACT PRICE or the CONTRACT TIME issued on or after the effective date of the AGREEMENT.
- 1.19 CONTRACT DOCUMENTS: The AGREEMENT, ADDENDA, CONTRACTOR'S BID, NOTICE OF AWARD, NOTICE TO PROCEED, the BONDS, these General Provisions, the SPECIAL PROVISIONS, the SPECIFICATIONS and PLANS, WRITTEN AMENDMENTS, CHANGE ORDERS, FIELD ORDERS, and the DESIGN PROFESSIONAL'S written interpretations and clarifications issued on or after the EFFECTIVE DATE OF THE AGREEMENT.
- 1.20 CONTRACT PRICE: The total moneys payable by the CITY to the CONTRACTOR under the terms and conditions of the CONTRACT DOCUMENTS.

- 1.21 **CONTRACT TIME:** The number of calendar days within which, or the dates by which the WORK is to be substantially completed and also completed and ready for final payment are set forth in the AGREEMENT, including authorized time extensions.
- 1.22 **CONTRACTOR:** The individual, firm or corporation who enters into an AGREEMENT awarded him by the CITY. The CONTRACTOR may act directly or through a lawfully authorized agent or employee.
- 1.23 **CONTROLLING ITEMS OF WORK:** Items of construction that should be in progress at the time, as essential to the orderly completion of the WORK within the time limit specified, in accordance with the CONTRACTOR'S approved progress schedule.
- 1.24 **DEFECTIVE:** An item of work that is unsatisfactory, faulty, or deficient in that it does not conform to the CONTRACT DOCUMENTS, or does not meet the requirement of any inspection, reference standard, test or required approvals.
- 1.25 **DRAWINGS:** Individual sheets of the Construction PLANS which contain graphic information concerning the Proposed WORK which have been prepared or approved by DESIGN PROFESSIONAL and are referred to in the CONTRACT DOCUMENTS. Shop drawings are not drawings as defined herein.
- 1.26 **EFFECTIVE DATE OF AGREEMENT:** The date indicated in the AGREEMENT on which it becomes effective, but if no such date is indicated, it means the date on which the AGREEMENT is signed by the mayor.
- 1.27 **FIELD ORDER:** A written order affecting a change in the WORK not involving an adjustment in the CONTRACT PRICE or an extension of the CONTRACT TIME, issued by the DESIGN PROFESSIONAL to the CONTRACTOR during construction.
- 1.28 **HAZARDOUS WASTE:** The term HAZARDOUS WASTE shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
- 1.29 **LAWS AND REGULATIONS:** Any and all applicable laws, rules, regulations, ordinances, codes and orders of governmental bodies, agencies, authorities, and courts having jurisdiction.
- 1.30 **LABORATORY:** The testing laboratories employed by the CITY to make required tests.
- 1.31 **LIENS:** Liens, charges, security interests or encumbrances upon real property or personal property.
- 1.32 **NOTICE OF AWARD:** A written notice given by the CITY or DESIGN PROFESSIONAL to the apparent successful BIDDER. The notice may enumerate conditions precedent to the award which require compliance activity from the apparent low BIDDER, such as submission of BONDS, construction scheduling, etc. Where no formal written notice is provided, the AGREEMENT shall constitute NOTICE OF AWARD.
- 1.33 **NOTICE TO PROCEED:** A written notice from the CITY or DESIGN PROFESSIONAL notifying the CONTRACTOR to begin the prosecution of the WORK.
- 1.34 **PARTIAL UTILIZATION:** Use by the CITY of a part of the WORK for the purpose for which it is intended, prior to completion of all of the WORK.
- 1.35 **PLANS:** The set of DRAWINGS, consisting of profiles, typical cross sections, general cross sections, working DRAWINGS and supplemental DRAWINGS, or exact reproductions thereof,

which show the location, character, dimension and details of WORK to be done, and which are to be considered as part of the CONTRACT, supplementary to the SPECIFICATIONS.

- 1.36 PROJECT: The total of the WORK to be provided as specified by the CONTRACT DOCUMENTS.
- 1.37 PROJECT REPRESENTATIVE: The authorized representative of the DESIGN PROFESSIONAL or CITY who may be assigned to the site or any part thereof.
- 1.38 SAMPLES: Physical examples of material, equipment, or workmanship that are representative of some portion of the work and which establish the standard by which such portion of the WORK will be judged.
- 1.39 SHOP DRAWINGS: All drawings, diagrams, illustration, schedules, and other data or information which are submitted by the CONTRACTOR to illustrate some portion of the WORK.
- 1.40 SPECIAL PROVISIONS: The specific clauses or provisions setting forth conditions or requirements, peculiar to the PROJECT under consideration and covering WORK or materials involved in the proposal but not thoroughly or satisfactorily stipulated or set forth by the General Provisions.
- 1.41 SPECIFICATIONS: Those portions of the CONTRACT DOCUMENTS consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the WORK.
- 1.42 SUBCONTRACTOR: Any individual, firm, partnership, or corporation who contracts with the CONTRACTOR to perform any part of the PROJECT covered by the CONTRACT.
- 1.43 SUPPLIER: A manufacturer, fabricator, supplier, distributor, material man or vendor having a direct contract with the CONTRACTOR or with any SUBCONTRACTOR to furnish materials or equipment to be incorporated into the WORK.
- 1.44 UNDERGROUND FACILITIES: All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments along with any encasements containing such facilities which have been installed underground to furnish: electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems or water.
- 1.45 UNIT PRICE WORK: Work to be paid on the basis of unit prices.
- 1.46 WORK: All labor, materials, equipment, and/or services required to be incorporated into the construction necessary to produce the PROJECT specified by the CONTRACT DOCUMENTS.
- 1.47 WORKING DAY: A calendar day, with exceptions stated herein, on which weather and other conditions not under control of CONTRACTOR engaged in performing the CONTROLLING ITEMS OF WORK could not have been reasonably anticipated and had an adverse effect on the scheduled construction. No WORKING DAYS will be charged for the following days:
  - A. Days on which delays, attributable solely to the CITY or other governmental agencies prevent CONTRACTOR from proceeding with the CONTROLLING ITEMS OF WORK at time of delay, but not including days of shut down resulting from action or non-action of CONTRACTOR.

- B. Days on which delays are attributable to the direct effect of strikes, riots, or civil commotions.
- 1.48 WRITTEN AMENDMENT: A WRITTEN AMENDMENT of the CONTRACT DOCUMENTS, signed by the CITY and CONTRACTOR on or after the EFFECTIVE DATE of the AGREEMENT and normally dealing with the non-ARCHITECT / ENGINEERING or non-technical rather than strictly construction-related aspects of the CONTRACT DOCUMENTS.
- 1.49 DEFINITION OF ALPHABETICAL TERMS:
- A.A.S.H.T.O. : American Association of State Highway Transportation Officials
- A.S.T.M. : American Society for Testing Materials
- A.S.A. : American Standards Association
- A.W.W.A. : American Water Works Association
- A.W.P.A. : American Wood Preservers Association
- LA DOTD : Louisiana Department of Transportation and Development
- C.O.A. : City of Alexandria
- M.U.T.C.D. : Manual on Uniform Traffic Control Devices, latest edition
- 1.50 OR EQUAL: Whenever in these CONTRACT DOCUMENTS a particular brand, make of material, device or equipment is specified, followed by the words "or EQUAL", such brand, make of material, device, or equipment should be regarded merely as establishing a standard or quality. If two or more brands, makes of material, devices, or equipment are shown or specified, each should be regarded as the EQUAL of the other. Any other brand, make of material, device, or equipment, which, in the opinion of the DESIGN PROFESSIONAL, is the recognized EQUAL of that specified, considering quality, workmanship, and economy of operation, and is suitable for the purpose intended, may be accepted by the DESIGN PROFESSIONAL as a substitute, provided that all materials and workmanship shall in every respect be in accordance with what, in the opinion of the DESIGN PROFESSIONAL, is the best modern practice.

END OF SECTION 1

## DIVISION 1

### General Provisions

#### Section 2

#### Instructions to Bidders

- 2.1 Advertisement for BIDS
  - 2.2 Contents of BID Forms
  - 2.3 Interpretation of Estimates
  - 2.4 Examination of DRAWINGS, SPECIFICATIONS, SPECIAL PROVISIONS and SITE of WORK
  - 2.5 Preparation of BIDS
  - 2.6 Rejection of BIDS
  - 2.7 BID Guaranty
  - 2.8 Delivery of BIDS
  - 2.9 Withdrawal of BIDS
  - 2.10 Opening of BIDS
  - 2.11 Disqualification of BIDDERS
  - 2.12 Competency of BIDDERS
  - 2.13 Joint BIDS
  - 2.14 Interpretations and ADDENDA
  - 2.15 Substitute Materials or Products - Prior Approvals
- 2.1 **ADVERTISEMENT FOR BIDS:** In conformity with STATE Law, the CITY will publish a "Notice to CONTRACTORS" requesting BIDS for the WORK. The advertisement for BIDS will contain a description of the WORK; a statement of the place where BIDS will be received and the time for opening same; and Instructions to BIDDERS as how to access DRAWINGS, SPECIFICATIONS, and proposals.
- 2.2 **CONTENTS OF BID FORMS:** BIDDERS will be furnished with Bid Forms, which will state the locations and description of the contemplated construction and will show the preliminary estimate of the various quantities and kinds of work to be performed, or materials to be furnished, with a schedule of items for which unit prices are asked. The PLANS and SPECIFICATIONS, in force at the time of receipt of BIDS, and the SPECIAL PROVISIONS and other CONTRACT DOCUMENTS will be considered a part of the BID whether attached or not. The BID shall be submitted to the Office of the City Clerk and one copy shall be retained by the BIDDER.
- 2.3 **INTERPRETATION OF ESTIMATES:** The quantities listed in the BID form are to be considered as approximate and are to be used only for the comparison of BIDS. Payment to the CONTRACTOR will be made only for the actual quantities of WORK performed and materials furnished in accordance with the AGREEMENT, and if, upon completion of the construction, the actual quantities shall show either an increase or decrease from the quantities given in the approximate estimate, the unit prices mentioned in the BID will prevail, except as otherwise herein provided.
- 2.4 **EXAMINATION OF DRAWINGS, SPECIFICATIONS, SPECIAL PROVISIONS, AND SITE OF WORK:** The BIDDER is required to examine carefully the site of the proposed PROJECT, BID FORMS, DRAWINGS, SPECIFICATIONS, SPECIAL PROVISIONS, AGREEMENT, BOND forms, and all the CONTRACT DOCUMENTS for the WORK contemplated and it will be assumed that the CONTRACTOR has investigated and satisfied himself as to the conditions to be encountered as to the character, quality and quantities of WORK to be performed and materials to be furnished, as to the requirements of these SPECIFICATIONS, SPECIAL PROVISIONS and AGREEMENT. BIDDERS are assumed to have made themselves familiar with all Federal and STATE Laws, Local

Laws, ordinances, and regulations which in any manner shall affect the work or its prosecution. The filing of a BID shall be presumptive evidence that the BIDDER has complied with these requirements.

- 2.5 PREPARATION OF BID: Unless otherwise specified, only BIDS submitted on the forms furnished by the DESIGN PROFESSIONAL will be considered. Except in the case of alternate items, the BIDDER must correctly fill in the spaces for each and every item, (written in ink, both in words and numerals), the unit prices for which he proposes to do the WORK contemplated or to furnish materials. Should the BIDDER fail to correctly submit a unit price for each item as prescribed above, his BID will be classed as irregular.
- 2.6 REJECTION OF BIDS: BIDS may be rejected in the case of any omission, alterations of forms, additions, or conditions not called for, unauthorized alternate BIDS, incomplete BIDS, erasures, or irregularities of any kind. BIDS received, conditioning their consideration or rejection upon BIDS for other work submitted by the same BIDDER may be classed as irregular, unless the SPECIAL PROVISIONS specifically invite or permit conditional or combination BIDS. BIDS not accompanied by a BID guaranty, or if the BID is not signed by the BIDDER, the BID shall be rejected.
- 2.7 BID GUARANTY: Each BID must be accompanied by a BID guaranty equal to five percent (5%) of the total amount of the highest combination for which a BID is submitted. Only Certified Checks or BID BONDS will be accepted as the BIDDER's guaranty with his proposal; any deviation from this requirement will be considered cause for rejection of the BID. The Certified Check shall be issued by a State or National Bank in good standing and shall be made payable to the CITY for not less than the amount specified above. Cashier's Checks or currency will not be accepted as a substitute for Certified Checks or BID BONDS. If Cashier's Check, uncertified check, or currency is enclosed with the BID, the BID will be considered informal and the Cashier's Check, uncertified check or currency and all other enclosures, will be returned to the BIDDER without having been read.
- 2.8 DELIVERY OF BIDS: Each BID shall be submitted together with the BID guaranty, in a sealed envelope addressed to the City of Alexandria, Alexandria City Hall, 915 Third Street, Alexandria, Louisiana 71301. Each sealed envelope containing a BID must be plainly marked on the outside with the "Name of the PROJECT being bid" and the envelope shall bear on the outside the BIDDER's name, address, and License Number. If forwarded by mail, the sealed envelope, containing the BID, must be enclosed in another envelope addressed to the CITY at the address provided above. BIDS shall be received up to the time stated in the Advertisement for bids and must be delivered to the CITY COUNCIL Meeting Chambers at the designated place before the expiration of the time stipulated in the Advertisement for bids. BIDS received after the stipulated time will be returned to the BIDDER, unopened.
- 2.9 WITHDRAWAL OF BIDS: A BIDDER may withdraw his BID up to the time set for opening BIDS. The withdrawal of a BID shall not prejudice the right of a BIDDER to file a new BID.
- 2.10 OPENING OF BIDS: BIDS will be opened and read publicly at the time and place indicated in the Advertisement for bids. BIDDERS or their authorized agents are invited to be present.
- 2.11 DISQUALIFICATION OF BIDDERS: If more than one BID is submitted by an individual, a firm or partnership, a corporation or association, under the same or different names, all BIDS so submitted shall be rejected. The BID will be rejected if there is any reason for believing that collusion exists among the BIDDERS and all participants in such collusion will not be considered in future BIDS for the same WORK. No CONTRACT will be awarded except to responsible BIDDERS capable of performing the class of WORK contemplated, and having sufficient equipment, financial resources, and experience to properly perform the WORK.
- 2.12 COMPETENCY OF BIDDERS: BIDDERS must be capable of performing the various items of WORK bid upon. The low BIDDER may be required to submit the following information to the CITY COUNCIL if requested:

- (a) A statement of his experience in similar work.
  - (b) A financial statement as of the date of the end of the last full quarter immediately preceding the date of opening of BIDS.
  - (c) A certification that he has not failed to carry out any previous CONTRACTS with the CITY.
  - (d) A list of the principal items of equipment and machinery which he proposes to use on the WORK, giving the make, model, capacity, size, age and general condition of all such equipment and machinery.
  - (e) A list giving the names and years of experience of the key personnel he expects to assign to the WORK.
  - (f) A certification that no liens are outstanding on any other contracts.
- 2.13 JOINT BIDS: When two or more persons, firms, or corporations tender a joint BID, each of said persons, firms, or corporations shall have complied with the requirements for prequalification when required in the SPECIAL PROVISIONS before a BID will be issued to them. Joint BIDS shall be fully executed by all interested parties by and for each of the persons, firms, or corporations interested in said joint BID, by the individual or officers authorized to enter into CONTRACTS for such firms or corporations. In the event of award of a Joint BID, each person, firm, or corporation shall assume the full obligation under the CONTRACT and Performance BOND.
- 2.14 INTERPRETATIONS AND ADDENDA All questions about the meaning or intent of the CONTRACT DOCUMENTS are to be directed to the DESIGN PROFESSIONAL. Interpretations or clarifications considered necessary by DESIGN PROFESSIONAL and response to such questions will be issued by ADDENDA mailed or delivered to all parties recorded by DESIGN PROFESSIONAL as having received the BIDDING DOCUMENTS. Questions received less than ten (10) days prior to the date for opening of BIDS may not be answered. Only questions answered by formal written ADDENDA will be binding. Oral and other interpretations or clarifications will be without legal affect.
- 2.14.1 ADDENDA: May also be issued to modify the BIDDING DOCUMENTS as deemed advisable by CITY and DESIGN PROFESSIONAL.
- 2.15 SUBSTITUTE MATERIALS OR PRODUCTS - PRIOR APPROVALS: In unusual cases where a closed specification has been justified for prior acceptance by the CITY in conformance with Louisiana Revised Statues RS 38:2291 and 38:2292, the naming of that product in the DRAWINGS and SPECIFICATIONS will be followed by wording indicating that no SUBSTITUTION is permitted.
- 2.15.1 OTHERWISE where the DRAWINGS and SPECIFICATIONS identify a product by a specific brand, make, manufacture, or definite specification, it is to establish the required quality standard for the product regarding style, type, character, materials of construction, function, accessories, dimensions, appearance, and durability. Products which are determined to be equivalent by the DESIGN PROFESSIONAL will be acceptable. Products which are specified by specific brand, make or manufacturers name may also be specified by its applicable model or catalog number or other product designation.
- 2.15.2 SELECTED MATERIALS AND EQUIPMENT: Several alternatives' suppliers or manufacturers have been identified. If the BIDDER desires to obtain approval of materials or equipment from other alternative suppliers or manufacturers to those identified in the SPECIFICATIONS, a written request for a SUBSTITUTION shall be submitted to the DESIGN PROFESSIONAL at least fifteen (15) days prior to the BID opening date. Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute



including drawings, cuts, performance and test data and other information necessary for an evaluation.

A statement setting forth any changes in other materials, equipment or work that incorporation of the substitute would require shall be included. The burden of proof of the merit of the proposed substitution is upon the BIDDER. The DESIGN PROFESSIONAL'S decision of approval or disapproval of a proposed substitution shall be final. If DESIGN PROFESSIONAL approves any proposed substitution, such approval will be set forth in an ADDENDA issued to all prospective BIDDERS. BIDDERS shall not rely upon approvals made in any other manner.

- 2.15.3 AFTER RECEIPT OF BIDS: The CONTRACT, if awarded, will be on the basis of material and product described in the DRAWINGS or specified in the SPECIFICATIONS without consideration of possible substitute of or "EQUAL" items except as specified in 2.15.2 above.

END OF SECTION 2

## DIVISION 1

### General Provisions

#### Section 3

##### Award and Execution of Contract

- 3.1 Consideration of BIDS
- 3.2 Award of AGREEMENT
- 3.3 Return of BID BONDS
- 3.4 Execution of AGREEMENT
- 3.5 Performance, Payment, and Other BONDS
- 3.6 Personnel Employment
- 3.7 Copies of CONTRACT DOCUMENTS
- 3.8 Failure to Execute Contracts
- 3.9 Commencement of CONTRACT TIME; NOTICE TO PROCEED
- 3.10 Preconstruction Conference
- 3.11 Starting the WORK
- 3.12 Before Starting Construction
- 3.13 Preliminary Schedules

- 3.1 **CONSIDERATION OF BIDS:** After the BIDS are opened and publicly read, the BID prices will be checked and tabulated as soon as possible. Comparison of acceptable BIDS will be based on the corrected summation of the extensions for each item at the unit prices BID. Prior to announcement of an award of the AGREEMENT, the CITY reserves the right to reject any or all BIDS in accordance with Louisiana Law.
- 3.2 **AWARD OF AGREEMENT:** The award of the AGREEMENT, if it be awarded, will be made to the lowest responsible BIDDER whose BID shall comply with all requirements necessary to render it formal. The award, if made, will be within Forty-Five (45) days after the opening of the BIDS. The successful BIDDER will be notified, by letter mailed to the address shown on the BID, that the BID has been accepted and that he has been awarded the AGREEMENT.
- 3.3 **RETURN OF BID BONDS:** All BID BONDS will be returned to the unsuccessful BIDDER(s) after the execution of the AGREEMENT with the lowest responsible BIDDER. Should the BIDDER to whom the work be awarded fail to enter into an AGREEMENT within the allotted time or fail to provide a Payment and Performance BOND, the amount of the BID BOND submitted by him will ipso facto, be forfeited to the CITY. Should no award be made within Forty-Five (45) days, all BIDS will be rejected, and all guaranties returned, unless the successful BIDDER agrees to a longer delay.
- 3.4 **EXECUTION OF AGREEMENT:** The successful BIDDER shall be required to execute the AGREEMENT, CONTRACTOR'S Affidavit, furnish Performance and Payment BONDS satisfactory to the CITY, along with his Certificate of Insurance, within ten (10) days after receipt of the NOTICE OF AWARD.
- 3.5 **PERFORMANCE, PAYMENT, AND OTHER BONDS:** CONTRACTOR shall furnish Performance and Payment BONDS, each in an amount at least equal to the CONTRACT PRICE as security for the faithful performance and payment of all CONTRACTOR'S obligations under the CONTRACT DOCUMENTS. These BONDS shall remain in effect at least until one year after the date when final payment becomes due, except as provided otherwise by Laws or Regulations or by the CONTRACT DOCUMENTS. CONTRACTOR shall also furnish such other BONDS as are required

by the SPECIAL PROVISIONS. All BONDS shall be on the forms prescribed by the CONTRACT DOCUMENTS except as provided otherwise by Laws or Regulations, and shall be executed by such SURETIES as are named in the current list of "Companies Holding Certificates of Authority as Acceptable SURETIES on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff, Bureau of Government Financial Operations, U.S. Treasury Department and registered to do business in the STATE. All BONDS signed by an agent must be accompanied by a certified copy of such agent's authority to act. All BONDS shall be furnished on CITY forms.

- 3.5.1 FAILURE OF SURETY: If the SURETY on any BOND furnished by CONTRACTOR is declared bankrupt or becomes insolvent or its right to do business is terminated in the STATE, CONTRACTOR shall within ten days thereafter substitute another BOND and SURETY, both of which must be acceptable to CITY.
- 3.6 PERSONNEL EMPLOYMENT: As a condition of awarding the CONTRACT, the successful BIDDER for Public Works Projects, administered by or paid for in whole or in part by public funds of the City of Alexandria shall comply with LSA R.S. 38:2225.1, in which the CITY may at its sole discretion require that no less than 80% of the total work force required to complete the PROJECT be residents of the State of Louisiana.
- 3.7 COPIES OF CONTRACT DOCUMENTS: The CITY shall furnish to CONTRACTOR up to ten (10) copies (unless otherwise specified in the SPECIAL PROVISIONS) of the CONTRACT DOCUMENTS as are reasonably necessary for the execution of the WORK. Additional copies will be furnished, upon request, at the cost of reproduction.
- 3.8 FAILURE TO EXECUTE AGREEMENT: In the event of failure or refusal on the part of the BIDDER to whom the award is made to execute the AGREEMENT and furnish satisfactory BONDS within ten (10) days after receipt of the NOTICE OF AWARD the amount of the BID BOND accompanying his BID shall be forfeited to the CITY. The CITY, within ten (10) days of receipt of an acceptable AGREEMENT, Performance BOND, Payment BOND, CONTRACTOR'S Affidavit, and Certificate of Insurance, executed by the party to whom the CONTRACT was awarded, will sign the AGREEMENT and return to such party an executed duplicate of the AGREEMENT. Should the CITY not execute the AGREEMENT within such period, the BIDDER may by written notice withdraw the signed AGREEMENT. Such notice of withdrawal shall be effective upon receipt of the notice by the CITY.
- 3.9 COMMENCEMENT OF CONTRACT TIME; NOTICE TO PROCEED: The CONTRACT TIME will commence to run on the day that NOTICE TO PROCEED is given, or on the day indicated in the NOTICE TO PROCEED. A NOTICE TO PROCEED may be given at any time within thirty days after the EFFECTIVE DATE OF THE AGREEMENT. Should there be any reason as to why the NOTICE TO PROCEED cannot be issued within such period, the time may be extended by mutual agreement between the CITY and CONTRACTOR.
- 3.10 PRECONSTRUCTION CONFERENCE: Prior to beginning construction, a preconstruction conference will be held between the CONTRACTOR and the DESIGN PROFESSIONAL to reach agreements relating to responsibilities and procedures of each interested party to see that the PROJECT is built according to the approved PLANS and SPECIFICATIONS and the conditions under which disbursements for construction cost are authorized and will be paid. The DESIGN PROFESSIONAL will prearrange this meeting.
- 3.11 BEFORE STARTING CONSTRUCTION: Before undertaking each part of the WORK, CONTRACTOR shall carefully study and compare the CONTRACT DOCUMENTS and check and verify pertinent figures shown thereon and all applicable field measurements. CONTRACTOR shall promptly report in writing to DESIGN PROFESSIONAL any conflict, error, ambiguity or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from DESIGN PROFESSIONAL before proceeding with any work affected thereby; however,

CONTRACTOR shall not be liable to CITY or DESIGN PROFESSIONAL for failure to report any conflict, error, ambiguity or discrepancy in the CONTRACT DOCUMENTS, unless CONTRACTOR knew or reasonably should have known thereof.

- 3.12 STARTING THE WORK: CONTRACTOR shall start to perform the WORK on the date when the CONTRACT TIME commences to run, but no work shall be done at the site prior to the issuance of a NOTICE TO PROCEED.
- 3.13 PRELIMINARY SCHEDULES: Within ten (10) days after the receipt of the NOTICE OF AWARD (unless otherwise specified in the SPECIAL PROVISIONS), CONTRACTOR shall submit to DESIGN PROFESSIONAL along with the executed AGREEMENT, the following for review:
- (a) A preliminary progress schedule indicating the times (numbers of days or dates) for starting and completing the various CONTROLLING ITEMS OF WORK;
  - (b) A preliminary schedule of SHOP DRAWING and SAMPLE submittals which will list each required submittal and the times for submitting, reviewing and processing such submittal;
  - (c) A preliminary schedule of values for lump sum items which will include quantities and prices of items aggregating the CONTRACT PRICE and will subdivide the WORK into component parts in sufficient detail to serve as the basis for progress payments during construction. Such prices will include an appropriate amount of overhead and profit applicable to each item of work;
  - (d) Before any work at the site is started, CONTRACTOR shall deliver with copies to each additional insured identified in the SPECIAL PROVISIONS, Certificates of Insurance (and other evidence of insurance) which CONTRACTOR is required to purchase and maintain.

END OF SECTION 3

## DIVISION 1

### General Provisions

#### Section 4

#### Contract Documents, Intent, Amending, Reuse

- 4.1 Intent
  - 4.2 Reference to Standards, Resolving Discrepancies
  - 4.3 Amending CONTRACT DOCUMENTS
  - 4.4 Notice to SURETY
  - 4.5 Supplementing CONTRACT DOCUMENTS
  - 4.6 Reuse of Documents
  - 4.7 SPECIAL PROVISIONS
- 4.1 INTENT: The CONTRACT DOCUMENTS comprise the entire AGREEMENT between the CITY and the CONTRACTOR concerning the WORK. The intent of the CONTRACT DOCUMENTS is to prescribe a complete WORK or improvement which the CONTRACTOR shall undertake to do in full compliance with the DRAWINGS and SPECIFICATIONS and in conformity with the General and SPECIAL PROVISIONS and the terms and conditions of the CONTRACT. The CONTRACTOR shall do all work including such incidental work as may be reasonably implied as being necessary to complete the WORK in a satisfactory and acceptable manner. He shall furnish, unless otherwise provided for in the AGREEMENT, all materials, supplies, equipment, tools, labor and incidentals necessary to prosecute and complete the WORK. Any work, materials or equipment that may reasonably be inferred from the CONTRACT DOCUMENTS or from prevailing custom or trade usage as being required to produce the intended result will be furnished and performed whether or not specifically called for. When words or phrases which have a well-known technical or construction industry or trade meaning are used to describe work, materials or equipment, such words or phrases shall be interpreted in accordance with that meaning. Clarifications and interpretations of the CONTRACT DOCUMENTS shall be issued by DESIGN PROFESSIONAL.
- 4.1.1 ORDER OF PRECEDENCE: Should a conflict exist between the requirements of the Advertisement for BIDS, BID Proposal Form, Instruction to BIDDERS, SPECIAL PROVISIONS, Supplemental GENERAL PROVISIONS, PLANS or Technical SPECIFICATIONS, the former shall take precedence.
- 4.2 REFERENCE TO STANDARDS, RESOLVING DISCREPANCIES: Reference to standards, SPECIFICATIONS, manuals or codes of any technical society, organization or association, or to the Laws or Regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard, SPECIFICATION, manual, code or Laws or Regulations in effect at the time of opening of BIDS except as may be otherwise specifically stated in the CONTRACT DOCUMENTS. If during the performance of the WORK, CONTRACTOR discovers any conflict, error, ambiguity or discrepancy within the CONTRACT DOCUMENTS or between the CONTRACT DOCUMENTS and any provision of any such Law or Regulation applicable to the performance of the work or of any such standard, SPECIFICATION, manual or code or of any instruction to any SUPPLIER, CONTRACTOR shall report it to DESIGN PROFESSIONAL in writing at once, and, CONTRACTOR shall not proceed with the work affected thereby until a FIELD CHANGE, amendment, or supplement to the CONTRACT DOCUMENTS has been issued. The provisions of the CONTRACT DOCUMENTS shall take precedence in resolving any conflict, error, ambiguity or discrepancy between the provisions of the CONTRACT DOCUMENTS and:
- 4.2.1 The provisions of any such standard, SPECIFICATION, manual, code or instruction (whether or not specifically incorporated by reference in the CONTRACT DOCUMENTS); or

- 4.2.2 The Provision of any such Laws or Regulations applicable to the performance of the WORK (unless such an interpretation of the provisions of the CONTRACT DOCUMENTS would result in violation of such Law or Regulation). No provision of any such standard, SPECIFICATION, manual, code or instruction shall be effective to change the duties and responsibilities of the CITY, CONTRACTOR, DESIGN PROFESSIONAL, or any of their SUBCONTRACTORS, consultants, agents or employees from those set forth in the CONTRACT DOCUMENTS.
- 4.3 AMENDING CONTRACT DOCUMENTS: The CONTRACT DOCUMENTS may be amended to provide for additions, deletions and revisions in the WORK or to modify the terms and conditions by formal WRITTEN AMENDMENT or by CHANGE ORDER.
  - 4.3.1 WRITTEN AMENDMENTS (sometimes called supplemental agreements) authorize additions, deletions or revisions in the WORK and shall be used as the method to amend the AGREEMENTS when the addition, deletion or revision of quantities of pay items in the AGREEMENT exceed twenty-five percent (25%) of the total amount of the AGREEMENT.
  - 4.3.2 CHANGE ORDERS: Changes in the WORK through additions, deletions or revisions or changes which modify the WORK shall be authorized by CHANGE ORDER. The CITY and the CONTRACTOR shall execute appropriate CHANGE ORDERS recommended by the DESIGN PROFESSIONAL covering the following changes in the AGREEMENT.
    - 4.3.2.1 Changes in the WORK which are ordered by the CITY.
    - 4.3.2.2 Changes required for acceptance of DEFECTIVE WORK.
    - 4.3.2.3 Changes required for correction of DEFECTIVE WORK.
    - 4.3.2.4 Changes in the CONTRACT PRICE.
    - 4.3.2.5 Changes in the CONTRACT TIME.
- 4.4 NOTICE TO SURETY: If notice of any change affecting the general scope of the WORK or the CONTRACT DOCUMENTS is required by the provisions of the BOND to be given to SURETY, the giving of such notice shall be the CONTRACTOR'S responsibility.
- 4.5 SUPPLEMENTING CONTRACT DOCUMENTS: The requirements of the CONTRACT DOCUMENTS may be supplemented and minor variations and deviations in the WORK, may be authorized by FIELD ORDERS, DESIGN PROFESSIONAL'S approval of SHOP DRAWINGS or SAMPLES and by the DESIGN PROFESSIONAL'S written interpretation or clarifications.
  - 4.5.1 FIELD ORDER: The DESIGN PROFESSIONAL may issue a FIELD ORDER which authorizes minor variations in the WORK from the requirements of the CONTRACT DOCUMENTS and which does not involve an adjustment to the CONTRACT PRICE or the CONTRACT TIME. The CONTRACTOR shall proceed with the performance of any changes in the WORK so ordered by the DESIGN PROFESSIONAL unless the CONTRACTOR believes that such FIELD ORDER entitles the CONTRACTOR to a change in CONTRACT PRICE or TIME, or both, in which event the CONTRACTOR shall give the DESIGN PROFESSIONAL written notice thereof within seven (7) days after the receipt of the order to change. Within thirty (30) days after providing written notice to the DESIGN PROFESSIONAL, the CONTRACTOR shall document the basis for the change in CONTRACT PRICE or TIME.
  - 4.5.2 DESIGN PROFESSIONAL Approval of SHOP DRAWINGS: The DESIGN PROFESSIONAL will review and approve SHOP DRAWINGS and SAMPLES in accordance with the schedule defined in the SPECIFICATIONS, SPECIAL PROVISIONS or WORK scheduling requirements of the

CONTRACT DOCUMENTS. DESIGN PROFESSIONAL'S review and approval will be only to determine if the items in the submittal will conform to and be compatible with the design concept of the completed PROJECT. DESIGN PROFESSIONAL'S review and approval will not extend to means, methods, techniques, sequence or procedure of construction or to safety precautions or programs incident thereto. The review and approval of a separate item will not constitute approval of the assembly in which the item functions. CONTRACTOR shall make corrections required by DESIGN PROFESSIONAL, and shall return the required number of corrected copies of SHOP DRAWINGS and submit as required new SAMPLES for review and approval. DESIGN PROFESSIONAL'S review and approval of SHOP DRAWINGS or SAMPLES shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the CONTRACT DOCUMENTS unless CONTRACTOR has in writing called DESIGN PROFESSIONAL'S attention to each such variation at the time of submission and DESIGN PROFESSIONAL has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the SHOP DRAWING or SAMPLE approval.

- 4.5.3 Where a SHOP DRAWING or SAMPLE is required by the CONTRACT DOCUMENTS or the schedule of SHOP DRAWINGS and SAMPLE submissions accepted by DESIGN PROFESSIONAL as required by the CONTRACT DOCUMENTS, any related work performed prior to DESIGN PROFESSIONAL'S review and approval of the pertinent submittal will be at the sole expense and the responsibility of the CONTRACTOR.
- 4.5.4 Clarifications and Interpretations: DESIGN PROFESSIONAL will issue with reasonable promptness such written clarifications or interpretations of the requirements of the CONTRACT DOCUMENTS (in the form of DRAWINGS or otherwise) as DESIGN PROFESSIONAL may determine necessary, which shall be consistent with the intent of the CONTRACT DOCUMENTS. Such written clarifications and interpretations will be binding on the CITY and CONTRACTOR. If the CITY or CONTRACTOR believes that a written clarification or interpretation justifies an adjustment in the CONTRACT PRICE or the CONTRACT TIME and the parties are unable to agree to the amount or extent thereof, if any, the CITY or CONTRACTOR may make a written claim as provided in Sections 11 and 12 of these general conditions.
- 4.6 REUSE OF DOCUMENTS: CONTRACTOR, and any SUBCONTRACTOR or SUPPLIER or other person or organization performing or furnishing any of the WORK under a direct or indirect CONTRACT with the CITY (i) shall not have or acquire any title to or ownership rights in any of the PLANS, SPECIFICATIONS or other documents (or copies of any thereof) prepared by or bearing the seal of DESIGN PROFESSIONAL, and (ii) shall not reuse any of such PLANS, SPECIFICATIONS, other documents or copies on extensions of the PROJECT or any other PROJECT without written consent of the CITY and the DESIGN PROFESSIONAL.
- 4.7 SPECIAL PROVISIONS: Construction Procedures or conditions that have not been anticipated in these General Provisions will be covered by SPECIAL PROVISIONS that will be considered a part of the AGREEMENT.

END OF SECTION 4

## DIVISION 1

### General Provision

#### Section 5

##### Lands: Rights-of-way, Physical Conditions, Subsurface Conditions

- 5.1 Lands and Rights-of-way
- 5.2 Subsurface and Physical Conditions
- 5.3 Limited Reliance on Technical Data
- 5.4 Physical Conditions - Underground Facilities
- 5.5 Construction Stakes
- 5.6 DESIGN PROFESSIONAL'S Level
- 5.7 ASBESTOS, PCB's, Petroleum, HAZARDOUS WASTE or Radioactive Material
- 5.8 Indemnity and Hold Harmless

5.1 LAND AND RIGHTS-OF-WAY: Prior to the issuance of the NOTICE TO PROCEED, the CITY shall obtain all land and rights-of-way necessary for carrying out and for the completion of the WORK to be performed pursuant to the CONTRACT DOCUMENTS, unless otherwise mutually agreed. The CITY shall provide the CONTRACTOR information that delineates and describes the lands owned and rights-of-way required and shall identify any encumbrances or restrictions related to use of the land. The CONTRACTOR shall provide at his own expense and without liability to the CITY any additional land and access thereto that the CONTRACTOR may desire for construction facilities or for storage of materials.

5.2 SUBSURFACE AND PHYSICAL CONDITIONS: The SPECIAL PROVISIONS may include data, reports and DRAWINGS that contain point of test or measurement of Subsurface and Physical Conditions.

5.2.1 Subsurface Conditions: Those reports of explorations and tests of Subsurface Conditions at or contiguous to the site that have been utilized by DESIGN PROFESSIONAL in preparing the CONTRACT DOCUMENTS.

5.2.2 Physical Conditions: Those DRAWINGS of Physical Conditions in or relating to existing surface or subsurface structures at or contiguous to the site that have been utilized by DESIGN PROFESSIONAL in preparing the CONTRACT DOCUMENTS.

5.3 LIMITED RELIANCE ON TECHNICAL DATA: The CONTRACTOR may rely upon the general accuracy of the Technical Data contained in reports and DRAWINGS of Subsurface Conditions and Physical Conditions, but such reports and DRAWINGS are not CONTRACT DOCUMENTS.

The CONTRACTOR shall adjudge the Technical Data as Technical Data and may not rely upon said data for the purpose of making claims against the CITY or DESIGN PROFESSIONAL with respect to the completeness of the reports and/or DRAWINGS as such might affect the means, methods, techniques, sequence or procedures of construction.

If the CONTRACTOR believes that any Subsurface or Physical Condition exists or that is uncovered is of such a nature that the Technical Data is inaccurate, differs materially from that shown in the CONTRACT DOCUMENTS or is of an unusual nature differing from conditions normally encountered, and will require a change in the CONTRACT DOCUMENTS; the CONTRACTOR will promptly notify the DESIGN PROFESSIONAL in writing of such conditions. CONTRACTOR will not further disturb such conditions or perform any WORK until receipt of a written order.



The DESIGN PROFESSIONAL will promptly review the pertinent conditions, determine if additional testing may be required or if CHANGE ORDERS reflecting CONTRACT TIME and CONTRACT PRICE should be recommended to the DIRECTOR OF PUBLIC WORKS.

If the CITY and the CONTRACTOR are unable to agree on entitlement regarding CONTRACT PRICE or CONTRACT TIME, the CONTRACTOR may reserve the option to make a claim in accordance with Sections 11 and 12 of these General Provisions.

5.4 PHYSICAL CONDITIONS - UNDERGROUND FACILITIES: Various PROJECTS may involve Underground Facilities not in the ownership of the CITY. Where information and data provided by others is incomplete or inaccurate, the DESIGN PROFESSIONAL and the CITY shall not be held liable for damage to the facility during the course of construction. It shall be the responsibility of the CONTRACTOR to accurately locate and coordinate the WORK around these facilities with the owner of such Underground Facilities.

5.4.1 Underground Facilities - Not Shown: If an Underground Facility is uncovered or revealed which is not shown or indicated by the CONTRACT DOCUMENTS, CONTRACTOR will promptly notify the DESIGN PROFESSIONAL. If the owner of the Underground Facility is known or can be identified, the CONTRACTOR will notify said owner and document the consequences of the existence of the facilities as they may affect the WORK. If the DESIGN PROFESSIONAL concludes that a change in the CONTRACT DOCUMENTS is needed, DESIGN PROFESSIONAL shall recommend said change to the CITY as set forth in these General Provisions.

5.5 CONSTRUCTION STAKES: The DESIGN PROFESSIONAL will furnish and set the necessary construction stakes on original layouts, marking the general locations, alignments, elevations, and grade of the work. The CONTRACTOR, however, will be required to check all leading dimensions and clearances measured from such stakes and thereafter become responsible for the alignment, elevations, and dimensions of all parts of the work and their mutual agreement.

The CONTRACTOR shall furnish, at his own expense, all batter boards, templates, and other material for marking, referencing, and maintaining points, lines and grades and shall furnish the DESIGN PROFESSIONAL with such incidental labor as he may require in establishing points, lines, and grades necessary to the prosecution of the WORK.

The CONTRACTOR shall be held responsible for the preservation of all stakes, transit points, benchmarks, hubs and guard stakes. If, in the opinion of the DESIGN PROFESSIONAL, any of the original construction stakes or markers have been carelessly or willfully destroyed or disturbed by the CONTRACTOR, the cost of replacing them shall be deducted from any money due the CONTRACTOR.

5.6 ENGINEER'S LEVEL: The CONTRACTOR shall have an engineer's Level in working condition and acceptable to the DESIGN PROFESSIONAL on the PROJECT at all times for his use and the use of the PROJECT REPRESENTATIVE in checking forms and stakes that appear to be disturbed and in transferring grades.

5.7 ASBESTOS, PCB'S, PETROLEUM, HAZARDOUS WASTE, HAZARDOUS MATERIAL OR RADIOACTIVE MATERIAL: The CITY shall be responsible for any ASBESTOS, PCB's, Petroleum, HAZARDOUS WASTE, HAZARDOUS MATERIAL or Radioactive Material uncovered or revealed at the site which was not shown or indicated in DRAWINGS or SPECIFICATIONS or identified in the CONTACT DOCUMENTS to be within the scope of WORK and which may present a substantial danger to persons or property in connection with WORK at the site. The CITY will not be responsible for any such material brought to the site by CONTRACTOR, SUBCONTRACTOR, SUPPLIER or anyone else for whom the CONTRACTOR is responsible. In the event of such incident, the CONTRACTOR will promptly notify the DESIGN PROFESSIONAL.

CONTRACTOR will not be required to work at the site until it has been rendered safe. CONTRACTOR may be entitled to changes in the CONTRACT DOCUMENTS due to WORK stoppage. If the CITY and CONTRACTOR are unable to agree on CONTRACT PRICE or CONTRACT TIME due to the stoppage, either may make a claim as provided in these General Provisions. The CITY further reserves the right to redirect the CONTRACTOR to other work within the PROJECT and within the scope of the CONTRACT DOCUMENTS, if available and reasonable with minor mobilization reimbursement.

- 5.8 INDEMNITY AND HOLD HARMLESS: To the fullest extent permitted by laws and regulations the CITY shall indemnify and hold harmless CONTRACTOR, SUBCONTRACTORS, DESIGN PROFESSIONAL, DESIGN PROFESSIONAL CONSULTANTS, and the Officers, Directors, Employees, Agents, other consultants and subcontractors of each and any of them from and against all claims, costs, losses and damages arising out of or resulting from such hazardous condition, provided that: (i) any such claim, cost, loss or damage is attributable to bodily injury, sickness, disease or death, or injury to or destruction of tangible property (other than WORK itself) including the loss of use resulting there from and (ii) nothing in this paragraph 5.8 shall obligate CITY to indemnify any person or entity from and against the consequences of that persons or entities on negligence.

END OF SECTION 5

## DIVISION 1

### General Provisions

#### Section 6

##### Insurance, Partial Utilization, Preservation and Restoration

- 6.1 Insurance
- 6.2 Types of Insurance
- 6.3 Builder's Risk
- 6.4 Partial Utilization
- 6.5 Preservations and Restoration of Property, Trees, Monuments

- 6.1 INSURANCE: All Insurance required by these GENERAL PROVISIONS are to be purchased by the CONTRACTOR shall be obtained from Insurance companies that are licensed or authorized in the STATE.

The Insurance Carriers shall have a current A.M. Best Guide rating of A-V or better, unless otherwise authorized by the CITY in writing. This shall include "Self-Insured Retention" Plans. CONTRACTOR shall deliver to the CITY with copies of each additional insured identified in the SPECIAL PROVISIONS, Certificates of Insurance which are required by these and the SPECIAL PROVISIONS.

- 6.2 TYPES OF INSURANCE: The CONTRACTOR, shall purchase and maintain such liability and other insurance as is appropriate for the WORK being performed and furnished, as well as provide protection from claims set forth below which may arise out of, or result from, CONTRACTORS performance and furnishing of the WORK and CONTRACTORS other obligations under the CONTRACT DOCUMENTS, whether it is to be performed or furnished by CONTRACTOR, any sub-contractor or supplier, or by anyone directly or indirectly employed by any of them to perform or furnish any of the WORK, or by anyone for whose acts any of them may be liable:
- 6.2.1 Claims under Workers Compensation, disability benefits and other similar employee benefit acts.
  - 6.2.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTORS EMPLOYEES;
  - 6.2.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than CONTRACTORS EMPLOYEES;
  - 6.2.4 Claims for damages insured by customary personal injury liability coverage which are sustained (i) by any person as a result of an offense directly or indirectly related to the employment of such person by CONTRACTOR or (ii) by any other person for any other reason;
  - 6.2.5 Claims for damages, other than to the WORK itself, because of injury to or destruction of tangible property where ever located, including loss of use resulting there from; and
  - 6.2.6 Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

The policies of insurance so required by this paragraph 6.2 to be purchased and maintained shall:

- 6.2.7 With respect to insurance required by paragraphs 6.2.3 through 6.2.5 inclusive, include as additional insureds (subject to any customary exclusion in respect of professional liability.)

CITY, DESIGN PROFESSIONAL, and any other persons or entities identified in the special provisions, all of whom shall be listed as additional insureds, and include coverage for the respective officers and employees of all such additional insureds;

- 6.2.8 Include the specific coverages and be written for not less than the limits of liability provided in the special provisions, or required by laws or regulations, whichever is greater;
- 6.2.9 Include completed operations insurance.
- 6.2.10 Contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to CITY and CONTRACTOR and to each other additional insured identified in the special provisions to whom a certificate of insurance has been issued.
- 6.2.11 Remain in effect at least until final payment and at all times thereafter when CONTRACTOR may be correcting, removing or replacing DEFECTIVE work;
- 6.2.12 With respect to completed operations insurance, and any insurance coverage written on a claims made basis, remain in effect for at least 2 years after final payment.
- 6.3 BUILDER'S RISK: Builder's Risk Insurance is not required; however, if this Insurance is not secured, the CONTRACTOR cannot request payment per invoice cost for materials stored on the PROJECT site. The CONTRACTOR may secure broad form "All Risk" type Builder's Risk Insurance for the WORK to be performed which is insurable under this type of coverage. The policy shall cover not less than the losses due to fire, explosion, theft, hail, lightning, vandalism, malicious mischief, wind, collapse, riot, aircraft, and smoke during the CONTRACT TIME, and until the WORK is accepted by the CITY. The materials and equipment for those work items which are not insurable once installed (e.g., facilities to be installed beneath the ground surface) must be insured for all named perils during the CONTRACT TIME, and until the WORK is accepted by the CITY, regardless of the intended service of these items, and whether installed or not.
- 6.4 PARTIAL UTILIZATION - PROPERTY INSURANCE: If the CITY finds it necessary to occupy or use a portion or portions of the WORK prior to COMPLETION of all the WORK, such use or occupancy may be accomplished provided that no such use or occupancy shall commence before the insurers providing the property insurance have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.
- 6.5 RESERVATION AND RESTORATION OF PROPERTY, TREES, MONUMENTS: The CONTRACTOR shall be responsible for the preservation of all public and private property, trees and monuments, along and adjacent to the PROJECT and shall use every precaution necessary to prevent damage or injury thereto. He shall use suitable precaution necessary to prevent damage to pipes, conduits, and other underground structures and shall protect carefully from disturbance or damage all land monuments, CITY, STATE and United States benchmarks, Geodetic and Geological Survey Monuments and property markers until an authorized agent has witnessed or otherwise referenced their location and shall not remove them until directed. Any utility lines injured by the CONTRACTOR shall be repaired at once at his own expense in accordance with requirements of the General Provisions. The CONTRACTOR shall not injure or destroy trees or shrubs nor remove or cut them without proper authority. The CONTRACTOR shall be responsible for any damage done to public or private property by or on account of any act of omission, neglect, or misconduct in the execution of the WORK, or on account of DEFECTIVE WORK or material. He shall restore at his own expense such property to a condition similar or equal to that existing before such damage was done, by repairing, rebuilding or otherwise restoring same, or he shall make good such damage or injury in an acceptable manner. In case of failure on the part of a CONTRACTOR to restore such property or make good such damages or injury, the DESIGN

PROFESSIONAL may, after forty- eight (48) hours written notice, proceed to repair, rebuild or otherwise restore such property as may be deemed necessary and the cost therefor will be deducted from any monies due, or which may become due to the CONTRACTOR under this AGREEMENT. In case no money is due or to become due, his SURETY shall be held responsible until such time as all suits, claims or damages shall have been settled and suitable evidence to that effect furnished the DESIGN PROFESSIONAL.

END OF SECTION 6

## DIVISION 1

### General Provisions

#### Section 7

##### Contractor's Responsibilities and Prosecution of the Work

- 7.1 Supervision
- 7.2 Subletting or Assignment
- 7.3 Character of Workmen and Equipment
- 7.4 Source of Supply – Quality of Materials
- 7.5 Materials Furnished by CONTRACTOR
- 7.6 Storage of Materials
- 7.7 Defective Material
- 7.8 Samples and Tests
- 7.9 Substitutes and "OR EQUAL ITEMS"
- 7.10 SUBCONTRACTORS, SUPPLIERS and Others
- 7.11 Permits and Licenses
- 7.12 LAWS and REGULATIONS
- 7.13 Taxes
- 7.14 Use of Premises
- 7.15 Sanitary Provisions
- 7.16 Record Documents
- 7.17 Safety and Protection
- 7.18 Traffic Safety Precautions
- 7.19 SHOP DRAWINGS and SAMPLES
- 7.20 Indemnification
- 7.21 Cooperation with Public
- 7.22 CONTRACTORS General Warranty and Guarantee

- 7.1 SUPERVISION: CONTRACTOR shall supervise, inspect and direct the WORK competently and efficiently devoting such attention and applying such skills and expertise as may be necessary to perform the WORK in accordance with the CONTRACT DOCUMENTS. CONTRACTOR shall be solely responsible for the means, methods, techniques, consequences and procedures of construction. CONTRACTOR shall not be responsible for the negligence of others in the design or specification of a specific means, method, technique, sequence or procedure of construction which has been expressly required in the CONTRACT DOCUMENTS. CONTRACTOR shall be responsible to see that the completed WORK complies with the CONTRACT DOCUMENTS. CONTRACTOR shall keep on the PROJECT, at all times, during its progress a competent resident superintendent, who shall not be replaced without written notice to the CITY and the DESIGN PROFESSIONAL except under extraordinary circumstances. The superintendent will be CONTRACTOR'S representative at the site and shall have authority to act on behalf of CONTRACTOR. All communications to the superintendent shall be as binding as if given to CONTRACTOR.
- 7.2 SUBLETTING OR ASSIGNMENT: The CONTRACTOR shall not assign, sell, transfer or otherwise dispose of the AGREEMENT, or any portion thereof, or his rights, title or interest therein, without previous written approval of the CITY. The CONTRACTOR will not be permitted to sublet any portion of the AGREEMENT except for the delivery of materials, without the written approval of the DESIGN PROFESSIONAL.
- 7.2.1 The purchase of sand, gravel, crushed stones, crushed slag, batched concrete aggregates, ready mixed concrete and/or materials produced at and furnished from established and recognized commercial plants, together with the delivery of such materials to the site of the WORK by means

of vehicles owned or operated by such plants or by recognized commercial hauling companies, shall not be considered as subcontracting under these provisions.

- 7.2.2 No Subcontract will in any case relieve the CONTRACTOR of his responsibility under the AGREEMENT and BOND.
- 7.3 CHARACTER OF WORKMEN AND EQUIPMENT: The CONTRACTOR shall, at all times, employ sufficient labor and equipment for prosecuting the several classes of WORK to full completion in the manner and time specified. Failure by the CONTRACTOR to provide adequate equipment or labor may result in the annulment of the AGREEMENT.
- 7.3.1 All workmen must have sufficient skill and experience to perform properly the WORK assigned them. All workmen engaged on special WORK or skilled WORK, such as bituminous courses or mixtures, concrete base courses, pavements or structures, or in any trade, shall have sufficient experience in such WORK to properly and satisfactorily perform it and operate the equipment involved and shall make due and proper effort to execute the WORK in the manner prescribed in these SPECIFICATIONS.
- 7.3.2 All machinery and equipment owned or controlled by the CONTRACTOR, which is proposed to be employed by him on the WORK, shall be of sufficient size to meet the requirements of the WORK and shall be such as to produce a satisfactory quality of WORK.
- 7.4 SOURCE OF SUPPLY AND QUALITY OF MATERIALS: The source of supply of each of the materials shall be approved by the DESIGN PROFESSIONAL before the delivery is started. Representative preliminary SAMPLES of the character and quantity shall be submitted by the CONTRACTOR or produced for examination and testing in accordance with the methods referred to under tests of SAMPLES of materials. Only materials tested and found to conform to the requirements of the SPECIFICATIONS and approved by the DESIGN PROFESSIONAL shall be used in the WORK. All materials proposed to be used may be inspected or tested at any time during their preparation and use. If after trial, it is found that sources of supply that have been approved do not furnish a uniform product, or if the product from any source proves unacceptable at any time, the CONTRACTOR shall furnish approved materials from other approved sources. No material which, after approval, has in any way become unfit for use shall be used in the WORK. Stored material, even though approved before being stored, shall be inspected prior to use in the WORK and shall meet the requirements of the SPECIFICATIONS at the time of its use.
- 7.5 MATERIALS FURNISHED BY THE CONTRACTOR: Unless otherwise specifically stated in the CONTRACT, all materials needed in the WORK will be furnished by the CONTRACTOR. The CONTRACTOR will assume full responsibility in ordering materials of the quantity specified and required in the CONTRACT DOCUMENTS. The CONTRACTOR will assume full responsibility for the payment of all materials ordered by him in accordance with the CONTRACT, and this shall include the payment of all freight and demurrage charges incurred in the shipment. The CONTRACTOR will be responsible for the proper storage and handling of the material to insure the required quality before and during incorporation into the WORK.
- 7.6 STORAGE OF MATERIALS: Materials shall be stored so as to insure the preservation of their quality and fitness for the WORK, and in a manner that leaves the material accessible to inspection. With the approval of the DESIGN PROFESSIONAL, material may be stored on the right-of-way provided such storage does not interfere with the prosecution of the WORK or with public travel.
- 7.7 DEFECTIVE MATERIALS: All materials not conforming to the requirements of these SPECIFICATIONS shall be considered as DEFECTIVE and all such materials whether in place or not, shall be rejected and shall be removed immediately from the site of the WORK unless otherwise permitted in writing by the DESIGN PROFESSIONAL. Upon failure on the part of the CONTRACTOR to comply forthwith with any order by the DESIGN PROFESSIONAL made under the provisions of this article, the DESIGN PROFESSIONAL shall have the authority to remove and

replace DEFECTIVE material and to deduct the cost of removal and replacement from any monies due or to become due the CONTRACTOR.

- 7.8 SAMPLES AND TESTS: The CONTRACTOR shall give sufficient notification of the placing of orders for materials to permit testing; shall afford such facilities as the DESIGN PROFESSIONAL may require for collecting and forwarding SAMPLES; shall not make use of or incorporate in the WORK the materials represented by the SAMPLES until the tests have been made and the materials found to be in accordance with the requirements of the SPECIFICATIONS; and shall furnish, without charge, all the SAMPLES required.
- 7.8.1 When required by the DESIGN PROFESSIONAL, representative preliminary SAMPLES of the character and quantity prescribed shall be submitted by the CONTRACTOR or produced for examination and shall be tested in accordance with the methods referred to herein. The acceptance of a preliminary SAMPLE shall not be construed as acceptance of materials from the same source delivered later. Only the materials actually delivered for the WORK will be considered and their acceptance or rejection will be based solely on the results of the tests prescribed in the SPECIFICATIONS.
- 7.8.2 For the verification of weights or proportions and character of materials, and determinations of temperatures used in the preparation of the materials and mixtures, the DESIGN PROFESSIONAL shall have access at all times to all parts of any plants connected with the WORK. The CONTRACTOR shall facilitate and assist the verification of all scales, measures and other devices that he operates.
- 7.8.3 Unless otherwise specifically provided, all sampling and testing and laboratory methods required under this CONTRACT shall be in accordance with the latest revision of the standard Specifications of the American Society for Testing Materials, as amended to date of CONTRACT, and, when not covered therein, shall be sampled and tested in accordance with the Standard Specifications for Highway Materials and Methods of Sampling and Testing of the American Association of State Highway Officials, with subsequent revisions to date of CONTRACT. All tests not covered by the above shall be performed as specified by the DESIGN PROFESSIONAL.
- 7.9 SUBSTITUTES AND "OR EQUAL ITEMS": Whenever materials or equipment are specified or described in the CONTRACT DOCUMENTS by using the name of a proprietary item or the name of a particular SUPPLIER, the naming of the item is intended to establish the type, function and quality required. Unless the name, if followed by words indicating that no substitution is permitted, materials or equipment of other SUPPLIER may be accepted by DESIGN PROFESSIONAL if sufficient information is submitted by CONTRACTOR to allow DESIGN PROFESSIONAL to determine that the material or equipment proposed is equivalent or EQUAL to that named. The procedure for review by DESIGN PROFESSIONAL will include the following as supplemented in the General Provisions. Requests for review of substitute items of material and equipment, CONTRACTOR shall make written application to DESIGN PROFESSIONAL for acceptance thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the CONTRACTOR'S achievement of SUBSTANTIAL COMPLETION on time, whether or not acceptance of the substitute for use in the WORK will require a change in any of the CONTRACT DOCUMENTS (or in the provisions of any other direct CONTRACT with CITY for WORK on the PROJECT) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the WORK is subject to payment of any license fee or royalty. All variations of the proposed substitute from that specified will be identified and the service will be indicated. The application will also contain an itemized estimate of costs that will result directly or indirectly from acceptance of such substitute, including costs for redesign and claims of other contractors affected by the resulting change, all of which shall be considered by DESIGN PROFESSIONAL in evaluating the proposed substitute. DESIGN PROFESSIONAL may require CONTRACTOR to furnish at CONTRACTOR'S expense additional data about the proposed substitute.



- 7.9.1 If a specific means, method, technique, sequence or procedure of construction is indicated in or required by the CONTRACT DOCUMENTS, CONTRACTOR may furnish or utilize a substitute means, method, sequence, technique or procedure of construction acceptable to DESIGN PROFESSIONAL if CONTRACTOR submits sufficient information to allow DESIGN PROFESSIONAL to determine that the substitute proposed is equivalent to that indicated or required by the CONTRACT DOCUMENTS.
- 7.9.2 DESIGN PROFESSIONAL will be allowed a reasonable time within which to evaluate each proposed substitute. DESIGN PROFESSIONAL will be the sole judge of acceptability, and no substitute will be ordered, installed or utilized without DESIGN PROFESSIONAL'S prior written acceptance that will be evidenced by either a CHANGE ORDER or an approved SHOP DRAWING. The CITY may require CONTRACTOR to furnish at CONTRACTOR'S expense a special performance guarantee or other Surety with respect to any substitute. DESIGN PROFESSIONAL will record the time required by DESIGN PROFESSIONAL in evaluating substitutions proposed by CONTRACTOR and in making changes in the CONTRACT DOCUMENTS occasioned thereby. CONTRACTOR shall reimburse the CITY for the charges of DESIGN PROFESSIONAL for evaluating each proposed substitute.
- 7.10 SUBCONTRACTORS, SUPPLIERS AND OTHERS: CONTRACTOR shall not employ any SUBCONTRACTOR, SUPPLIER or other person against whom the DESIGN PROFESSIONAL or the CITY may have a reasonable objection. CONTRACTOR shall not be required to employ any SUBCONTRACTOR, SUPPLIER or other person against whom the CONTRACTOR has a reasonable objection.
- 7.10.1 CONTRACTOR shall be fully responsible to CITY and DESIGN PROFESSIONAL for all acts and omissions of the SUBCONTRACTORS, SUPPLIERS and other persons and organizations performing or furnishing any of the work under a direct or indirect contract with CONTRACTOR just as CONTRACTOR is responsible for CONTRACTORS on acts and omissions. Nothing in the CONTRACT DOCUMENTS shall create for the benefit of any such SUBCONTRACTOR, SUPPLIER, or other person or organization in any contractual relationship between CITY or DESIGN PROFESSIONAL and any such SUBCONTRACTOR, SUPPLIER or other person or organization, nor shall it create any obligation on the part of the CITY or DESIGN PROFESSIONAL to pay or to see to the payment of any monies due any such SUBCONTRACTOR, SUPPLIER or other person or organization except as may otherwise be required by laws and regulations.
- 7.10.2 CONTRACTOR shall be solely responsible for scheduling and coordinating the work of SUBCONTRACTORS, SUPPLIERS and other persons and organizations performing or furnishing any of the work under a direct or indirect contract with CONTRACTOR. CONTRACTOR shall require all SUBCONTRACTORS, SUPPLIER and other such persons or organizations performing or furnishing any of the work to communicate with DESIGN PROFESSIONAL through CONTRACTOR.
- 7.11 PERMITS AND LICENSES: The CONTRACTOR shall procure all permits and licenses, pay all charges and fees and give all notices incident to the lawful prosecution of the WORK.
- 7.12 LAWS AND REGULATIONS: The CONTRACTOR is presumed to have made himself familiar with, and at all time shall observe and comply with all Federal, STATE and Local laws and bylaws, ordinances and regulations in any manner affecting the conduct of the WORK, and shall indemnify and save harmless the CITY and its representatives against any claim or liability arising from or based on the violation of any such law, bylaw, ordinance or regulation, whether by himself or by his employees or SUBCONTRACTORS.
- 7.12.1 CONTRACTOR shall give all notices and comply with all laws and regulations applicable to furnishing and performance of the WORK. Except for otherwise expressly required by applicable

laws and regulations, neither CITY nor DESIGN PROFESSIONAL shall be responsible for monitoring CONTRACTORS' compliance with any laws or regulations.

- 7.12.2 If CONTRACTOR performs any work knowing or having reason to know that it is contrary to laws or regulations, CONTRACTOR shall bear all claims, costs, losses and damages caused by, arising out of or resulting therefrom; however, it shall not be CONTRACTORS primary responsibility to make certain that the specifications and drawings are in accordance with laws and regulations, but this shall not relieve CONTRACTOR of CONTRACTORS obligations under the CONTRACT DOCUMENTS.
- 7.13 TAXES: CONTRACTOR shall pay all sales, consumer, use or other similar taxes required to be paid by the CONTRACTOR under LAWS AND REGULATIONS.
- 7.14 USE OF PREMISES: The CONTRACTOR shall, at all times, conduct his WORK in such a manner and in such sequence as will insure the least practicable interference with traffic. He shall not open up WORK to the prejudice of WORK already started and this feature of the prosecution shall be governed by the order of the DESIGN PROFESSIONAL.
- 7.14.1 The CONTRACTOR shall confine construction equipment, the storage of materials and equipment and the operations of workers to the site and land and areas identified in and permitted by the contract documents and other land and areas permitted by laws and regulations, rights-of-way, permits and easements, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment. CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any adjacent land or areas, resulting from the performance of the WORK. Should any claim be made by any such owner or occupant because of the performance of the WORK, CONTRACTOR shall promptly settle with each other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law. CONTRACTOR shall, to the fullest extent permitted by laws and regulations, indemnify and hold harmless CITY, DESIGN PROFESSIONAL, DESIGN PROFESSIONALS' CONSULTANT and anyone directly or indirectly employed by any of them from and against all claims, cause, losses and damages arising out of or resulting from any claim or action, legal or equitable, brought by such owner or occupant against CITY, DESIGN PROFESSIONAL, or any other party indemnify here-under to the extent caused by or based upon CONTRACTORS performance of the work.
- 7.14.2 During the progress of the WORK, CONTRACTOR shall keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the WORK. At the completion of the WORK, CONTRACTOR shall remove all waste materials, rubbish and debris from and about the premise as well as all tools, appliances, construction equipment and machinery and surplus materials. CONTRACTOR shall leave the site clean and ready for occupancy by CITY at completion of the WORK. CONTRACTOR shall restore to original condition all property not designated for alteration by the CONTRACT DOCUMENTS.
- 7.14.3 CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall CONTRACTOR subject any part of the WORK or adjacent property to stresses or pressures that will endanger it.
- 7.15 SANITARY PROVISIONS: The CONTRACTOR shall observe all rules and regulations of the STATE Board of Health, or any bodies having jurisdiction, and of all local health officials and must take such precautions as are necessary to avoid unhealthful conditions.
- 7.16 RECORD DOCUMENTS: CONTRACTOR shall maintain in a safe place at the site one record copy of all DRAWINGS, SPECIFICATIONS, ADDENDA, WRITTEN AMENDMENTS, CHANGE ORDERS, FIELD ORDERS and written interpretations and clarifications in good order annotated to reflect changes during construction. These records along with approved SAMPLES and SHOP DRAWINGS will be available to the DESIGN PROFESSIONAL for reference. Upon completion of

the WORK, these record documents, SAMPLES and SHOP DRAWINGS will be delivered to DESIGN PROFESSIONAL for CITY.

- 7.17 SAFETY AND PROTECTION: CONTRACTOR shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the WORK. CONTRACTOR shall take all necessary precautions for the safety of, and provide the necessary protection to prevent damage, entry or loss to:
- 7.17.1 All persons on the WORK site or who may be affected by the WORK;
- 7.17.2 All the WORK and material and equipment to be incorporated therein, whether in storage on or off the site; and
- 7.17.3 Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and underground facilities not designated for removal, relocation, or replacement in the course of construction. CONTRACTOR shall comply with all applicable laws and regulations of any public body having jurisdiction for safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection.
- CONTRACTOR shall notify owners of adjacent property and of underground facilities and utility owners when prosecution of the WORK may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. All damage, injury or loss of any property referred to in this paragraph caused directly or indirectly, in all or in part by CONTRACTOR, any SUBCONTRACTOR, SUPPLIER, or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the work of anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR "except damage or loss attributable to the fault of DRAWINGS or SPECIFICATIONS or to the acts or omissions of CITY, or DESIGN PROFESSIONAL, or anyone employed by them or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of CONTRACTOR or any SUBCONTRACTOR, SUPPLIER or any person or organization directly or indirectly employed by any of them". CONTRACTOR'S duties and responsibilities for safety and for protection of the work shall continue until such time as all the work is completed and DESIGN PROFESSIONAL is issued a notice to CITY and CONTRACTOR in accordance with the contract documents that the WORK is acceptable.
- 7.18 TRAFFIC SAFETY PRECAUTIONS: The CONTRACTOR shall at all times so conduct his WORK as to insure the least practicable obstruction to traffic. The convenience of the general public, the residents along and adjacent to the PROJECT, and the protection of persons and property are of prime importance and shall be adequately provided for by the CONTRACTOR. Fire hydrants on or adjacent to the PROJECT shall be kept accessible to the Fire Department at all times and no material or obstructions shall be placed within ten feet of any such hydrant. Materials stored upon the street shall be placed so as to cause no unnecessary obstruction to the traveling public. When a street under CONTRACT is already open to the traveling public, the CONTRACTOR shall maintain the existing road, the subgrade and the new pavement in such condition that the public can travel over same safely. In dry weather, he shall be responsible for wetting the roadway at frequent intervals to settle the dust. The CONTRACTOR shall cooperate with the DESIGN PROFESSIONAL in the regulation of traffic.
- 7.18.1 Satisfactory provisions for local traffic must be made by the CONTRACTOR at all times during construction, seeking at all times to inconvenience the public as little as possible.
- 7.18.2 The CONTRACTOR will not be allowed to obstruct private driveways or approaches, or to dig up or occupy the streets with materials more than is absolutely necessary for the prosecution of the WORK. Barricades shall be erected and maintained as provided in Section 7.17.3.
- 7.18.3 The CONTRACTOR shall provide, erect and maintain all necessary barricades, danger signals, signs, sufficient number of watchmen and take all necessary precautions for the protection of the WORK and workmen and the safety of the public. All traffic and pedestrian warning signs, devices

and procedures shall be in accordance with the "Manual on Uniform Traffic Control Devices, (MUTCD), for Streets and Highway". The CONTRACTOR will be held responsible for all damage to the PROJECT due to failure of the signs and/or barricades to properly protect the WORK from traffic, pedestrians, animals and from all other sources and whenever evidence of any such traffic is found damaging the unaccepted WORK, the DESIGN PROFESSIONAL will order that WORK be immediately removed and replaced by the CONTRACTOR without cost to the CITY. The CONTRACTOR'S responsibility for the maintenance of barricades, signs and lights shall not cease until the PROJECT shall have been completed and accepted. The CONTRACTOR shall notify the chief of the Fire and Police Departments whenever a section of street is closed to traffic and again when it is opened to public travel.

- 7.19 SHOP DRAWINGS AND SAMPLES: CONTRACTOR shall submit no less than four (4) copies, but in all cases the number required by specific specification section, of SHOP DRAWINGS to DESIGN PROFESSIONAL for review and approval in accordance with the accepted schedule of SHOP DRAWINGS and SAMPLES. All submittals will be identified as DESIGN PROFESSIONAL may require. The data shown on the SHOP DRAWINGS will be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to show DESIGN PROFESSIONAL the materials and equipment CONTRACTOR proposes to provide and to enable DESIGN PROFESSIONAL to review the information for the purposes intended.
- 7.19.1 CONTRACTOR shall also submit SAMPLES to DESIGN PROFESSIONAL for review and approval in accordance with said accepted schedule of SHOP DRAWINGS and SAMPLE submittals. Each SAMPLE will be identified clearly as to material, SUPPLIER, pertinent data such as catalog numbers and the use for which intended and otherwise as DESIGN PROFESSIONAL may require to enable DESIGN PROFESSIONAL to review the submittal for the limited purposes intended. The numbers of each SAMPLE to be submitted will be as specified in the SPECIFICATIONS.
- 7.19.2 Submittal Procedures: Before submitting each SHOP DRAWING or SAMPLE, CONTRACTOR shall have determined and verified:
  - 7.19.2.1 All field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar information with respect thereto,
  - 7.19.2.2 All materials with respect to intended use, fabrication, shipping, handling, storage, assembly and installation pertaining to the performance of the WORK, and
  - 7.19.2.3 All information relative to CONTRACTOR'S sole responsibilities in respect of means, methods, techniques, sequences and procedures of construction and safety precautions and programs incident thereto.
- 7.19.3 CONTRACTOR shall also have reviewed and coordinated each SHOP DRAWING or SAMPLE with other SHOP DRAWINGS and SAMPLES and with the requirements of the WORK, the CONTRACT DOCUMENTS, and in accordance with Section 4.5.2 of these general provisions.
  - 7.19.3.1 Each submittal will bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR'S obligations under the CONTRACT DOCUMENTS with respect to CONTRACTOR'S review and approval of that submittal.
  - 7.19.3.2 At the time of each submission, CONTRACTOR shall give DESIGN PROFESSIONAL specific written notice of such variations, if any, that the SHOP DRAWINGS or SAMPLE submitted may have from the requirements of the CONTRACT DOCUMENTS, such notice to be written communication separate from the submittal; and, in addition, shall cause a specific notation to be made on each SHOP DRAWING and SAMPLE submitted to DESIGN PROFESSIONAL for review and approval of each such variation.

- 7.20 INDEMNIFICATION: To the fullest extent permitted by LAWS AND REGULATIONS, CONTRACTOR shall indemnify and hold harmless the CITY, DESIGN PROFESSIONAL, and the officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, losses and damages (including but not limited to all fees and charges of DESIGN PROFESSIONALS, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) caused by, arising out of or resulting from the performance of the WORK, provided that any such claim, cost, loss or damage: (i) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the WORK itself), including the loss of use resulting therefrom, and (ii) is caused in whole or in part by any negligent act or omission of CONTRACTOR, or SUBCONTRACTOR, any SUPPLIER, any person or organization directly or indirectly employed by any of them to perform or furnish any of the WORK or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of a person or entity indemnified hereunder or whether liability is imposed upon such indemnified party by LAWS AND REGULATIONS regardless of the negligence of any such person or entity.
- 7.20.1 In any and all claims against CITY or DESIGN PROFESSIONAL or any of their respective consultants, agents, officers, directors or employees by any employee (or the survivor or personal representative of such employee) of CONTRACTOR, any SUBCONTRACTOR, any SUPPLIER, any person or organization directly or indirectly employed by any of them to perform or furnish any of the WORK, or anyone for whose acts any of them may be liable, the indemnification obligation under Section 7.20 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for CONTRACTOR or any such SUBCONTRACTOR, SUPPLIER, or other person or organization under workers' compensation acts, disability benefit acts or other employee benefit acts.
- 7.21 COOPERATION WITH PUBLIC UTILITIES: It shall be the CONTRACTOR'S responsibility to notify all public utilities or other parties interested to make all necessary adjustments of public utility fixtures and appurtenances within or adjacent to the limits of construction. Unless otherwise specified, these adjustments are to be made by the CITY. The location of utilities on the plan is incomplete and general and the CITY will not be responsible for any delay or extra cost due to errors in location, omission or unforeseen utilities.
- 7.21.1 The CONTRACTOR will be responsible for any damage done by him to any telephone, telegraph, power pole or lines, fire hydrant, gas, water, storm water or sanitary sewer line and service line, conduit and other accessories and appurtenances of a similar nature that are fixed or controlled by the CITY, a public utility company or a corporation. He shall perform and carry on his WORK in such a manner as not to interfere with or damage fixtures mentioned herein, or as shown on the DRAWINGS, or discovered during construction, which are to be left within the limits of the PROJECT. The CITY will not be responsible for any delay or damage incurred by the CONTRACTOR due to working around or joining his WORK to fixtures left in place.
- 7.21.2 The CITY will not be responsible for any delays or inconveniences to the CONTRACTOR in carrying on his WORK in the above mentioned manner and/or while the public utilities companies or the CITY are making necessary adjustments of their fixtures or appurtenances. Any additional cost incurred shall be at the expense of the CONTRACTOR and shall be considered as completely covered by the UNIT PRICES for the various pay items provided for in the proposal and AGREEMENT.
- 7.21.3 The CONTRACTOR shall contact the Water Department before using any water from any fire hydrants. A deposit must be paid, and a hydrant meter obtained. Damage to fire hydrants due to improper use by the CONTRACTOR shall be paid for by the CONTRACTOR.
- 7.22 CONTRACTORS GENERAL WARRANTY AND GUARANTEE: CONTRACTOR warrants and guarantees to owner, and DESIGN PROFESSIONAL that all WORK will be in accordance with the CONTRACT DOCUMENTS and will not be defective. CONTRACTORS warranty and

guarantee here-under excludes defects or damage caused by (i) abuse, modification or improper maintenance or operations by persons other than CONTRACTOR, SUBCONTRACTOR or SUPPLIERS; or (ii) normal wear and tear under normal usage.

- 7.22.1 CONTRACTORS obligation to perform and complete the WORK in accordance with the CONTRACT DOCUMENTS shall be absolute. None of the following will constitute an acceptance of WORK that is not in accordance with the CONTRACT DOCUMENTS or a release of CONTRACTORS obligation to perform the work in accordance with the CONTRACT DOCUMENTS:
  - 7.22.1.1 Observations by DESIGN PROFESSIONAL;
  - 7.22.1.2 Recommendation of any progress or final payment by DESIGN PROFESSIONAL;
  - 7.22.1.3 Issuance of a certificate of completion or any payment by CITY to CONTRACTOR under the CONTRACT DOCUMENTS;
  - 7.22.1.4 Use or occupancy of the WORK or any part thereof by CITY;
  - 7.22.1.5 Any acceptance by CITY of any failure to do so;
  - 7.22.1.6 Any review and approval of a SHOP DRAWING or SAMPLE submittal or the issuance of a notice of acceptability by DESIGN PROFESSIONAL;
  - 7.22.1.7 Any inspection, test or approval by other; or
  - 7.22.1.8 Any correction of defective WORK by CITY.

END OF SECTION 7

DIVISION 1

General Provisions

Section 8

DESIGN PROFESSIONAL'S Status During Construction

8.1	CITY'S Representative	8.6	Rejecting DEFECTIVE WORK
8.2	Visits to SITE	8.7	Determinations for Unit Price
8.3	PROJECT REPRESENTATIVE	8.8	Decisions on Disputes
8.4	Clarifications & Interpretations	8.9	Impartiality
8.5	Authorized Variations in WORK	8.10	Limitations on DESIGN PROFESSIONAL'S Authority and Responsibilities

- 8.1 CITY'S REPRESENTATIVE: DESIGN PROFESSIONAL will be CITY'S representative during the construction period. The duties and responsibilities and the limitations of authority of DESIGN PROFESSIONAL as CITY'S representative during construction are set forth in the CONTRACT DOCUMENTS and shall not be extended without written consent of CITY and DESIGN PROFESSIONAL.
- 8.2 VISITS TO SITE: DESIGN PROFESSIONAL will make visits to the site at intervals appropriate to the various stages of construction as DESIGN PROFESSIONAL deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of CONTRACTOR'S executed work. Based on information obtained during such visits and observations, DESIGN PROFESSIONAL will endeavor for the benefit of CITY to determine, in general, if the WORK is proceeding in accordance with CONTRACT DOCUMENTS. DESIGN PROFESSIONAL will not be required to make exhaustive or continuous on-site inspections to check the quality of quantity of the WORK. DESIGN PROFESSIONAL'S efforts will be directed toward providing for CITY at a greater degree of confidence that the completed WORK will conform generally to CONTRACT DOCUMENTS. On the basis of such visits and on-site observations, DESIGN PROFESSIONAL will keep CITY informed of the progress of the WORK and will endeavor to guard CITY against DEFECTIVE WORK. DESIGN PROFESSIONAL'S visits and on-site observations are subject to all the limitations on DESIGN PROFESSIONAL'S authority and responsibility set forth in paragraph. And particularly, without limitation, during or as a result of DESIGN PROFESSIONAL'S on-site visits or observations of CONTRACTORS work, DESIGN PROFESSIONAL will not supervise, direct, control or have authority over or be responsible for CONTRACTORS means, methods, techniques, sequences, or procedures of construction, of the safety precautions and programs incidental thereto, or for any failure of CONTRACTOR to comply with laws and regulations applicable to the furnishing or performance of the work.
- 8.3 PROJECT REPRESENTATIVE: If CITY and DESIGN PROFESSIONAL agree, DESIGN PROFESSIONAL will furnish a resident project representative to assist DESIGN PROFESSIONAL in providing more continuous observation of the WORK. The responsibilities and authorities and limitations thereon of any such resident project representative and assistance will be provided in this Section 8 and in SPECIAL PROVISIONS. If CITY designates another representative or agent to represent CITY at the site, who is not DESIGN PROFESSIONAL'S CONSULTANT, agent or employee, the responsibilities and authority and limitations thereon of such other person will be as provided in the SPECIAL PROVISIONS.

- 8.3.1 PROJECT REPRESENTATIVE shall be authorized to inspect all WORK done and all materials furnished. Such inspection may extend to all or any parts of the WORK and to the preparation or manufacture of the materials to be used. A PROJECT REPRESENTATIVE shall be stationed on the construction SITE to report to the DESIGN PROFESSIONAL as to the progress of the WORK and the manner in which it is being performed; also to report whenever it appears that the material furnished and the WORK performed by the CONTRACTOR fails to fulfill the requirements of the CONTRACT, and to call to the attention of the CONTRACTOR any such failure or other infringement, but such inspection shall not relieve the CONTRACTOR from any obligations to perform all the WORK in accordance with the requirements of the CONTRACT DOCUMENTS. In case of any dispute arising between the CONTRACTOR and the PROJECT REPRESENTATIVE as to materials furnished or the manner of performing the WORK, the PROJECT REPRESENTATIVE shall have the authority to reject the material or suspend the WORK until the question at issue can be referred to the DESIGN PROFESSIONAL. The PROJECT REPRESENTATIVE shall not, however, be authorized to revoke, alter, enlarge, relax or release any requirements of the DOCUMENTS, nor to approve or accept any portion of the WORK, nor to issue instructions contrary to the DRAWINGS and SPECIFICATIONS. He shall in no case act as foreman or perform other duties for the CONTRACTOR, nor interfere with the management of the WORK. Any advice that the PROJECT REPRESENTATIVE may give the CONTRACTOR shall in no way be construed as binding on the DESIGN PROFESSIONAL or the CITY in any way, or as releasing the CONTRACTOR from the fulfillment of the terms of the AGREEMENT.
- 8.3.2 INSPECTION: The DESIGN PROFESSIONAL and PROJECT REPRESENTATIVE shall have free access at all times to all parts of the WORK, and to materials intended for use in the WORK. The CONTRACTOR shall furnish the DESIGN PROFESSIONAL with every reasonable facility for ascertaining whether or not the WORK performed is in accordance with the requirements and intent of the CONTRACT DOCUMENT. The WORK will be inspected as it progresses, but failure to reject or condemn DEFECTIVE WORK or materials at the time it is done will in no way prevent its rejection whenever it is discovered. If the DESIGN PROFESSIONAL requests, the CONTRACTOR shall at any time before the acceptance of WORK, remove or uncover such portions of the finished WORK as may be directed. After examination, the CONTRACTOR shall restore said portions of the finished WORK to the standard required by the SPECIFICATIONS. Should the WORK thus exposed or examined prove acceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed, shall be paid for as Extra Work, but should the WORK so exposed or examined prove unacceptable, the uncovering or removing, and the replacing of the covering or making good of the parts removed shall be at the CONTRACTOR'S expense.
- 8.3.3 The CONTRACTOR shall notify the DESIGN PROFESSIONAL at least forty-eight (48) hours in advance of his intention to begin construction to assure the presence of a PROJECT REPRESENTATIVE on the SITE.
- 8.4 CLARIFICATIONS AND INTERPRETATIONS: DESIGN PROFESSIONAL will issue with reasonable promptness such written clarifications or interpretations of the requirements of the CONTRACT DOCUMENTS (in the form of DRAWINGS or otherwise) as DESIGN PROFESSIONAL may determine necessary, which shall be consistent with the intent of and reasonably inferable from the CONTRACT DOCUMENTS. Such written clarifications and interpretations will be binding on CITY and CONTRACTOR. If CITY or CONTRACTOR believes that a written clarification or interpretation justifies and adjustment in the CONTRACT PRICE or the CONTRACT TIME and the parties are unable to agree to the amount or extent thereof, if any, OWNER or CONTRACTOR may make a written claim therefore as provided in Article 11.
- 8.5 AUTHORIZED VARIATIONS IN WORK: DESIGN PROFESSIONAL may authorize minor variations in the WORK from the requirements of the CONTRACT DOCUMENTS which do not involve an adjustment in the CONTRACT PRICE or the CONTRACT TIME and are compatible with the design concept of the completed PROJECT as a functioning whole as indicated by the CONTRACT DOCUMENTS. These may be accomplished by a field order and will be binding on



CITY and also on CONTRACTOR who shall perform the WORK involved. If CITY or CONTRACTOR believes that a FIELD ORDER justifies an adjustment in the CONTRACT PRICE or the CONTRACT TIME and the parties are unable to agree on the amount or extent thereof, CITY or CONTRACTOR may make a written claim therefore as provided in Article 11.

- 8.6 REJECTING DEFECTIVE WORK: DESIGN PROFESSIONAL will have authority to disapprove or reject WORK which DESIGN PROFESSIONAL believes to be DEFECTIVE, or that DESIGN PROFESSIONAL believes will not produce a completed PROJECT that conforms to the CONTRACT DOCUMENTS or that will prejudice the integrity of the design concept of the completed PROJECT as a functioning whole as indicated by the CONTRACT DOCUMENTS. DESIGN PROFESSIONAL will also have authority to require special inspection or testing of the WORK as provided in these general provisions whether or not the WORK is fabricated, installed, or completed.
- 8.7 DETERMINATIONS FOR UNIT PRICES: DESIGN PROFESSIONAL will determine the actual quantities and classifications of unit price WORK performed by CONTRACTOR. DESIGN PROFESSIONAL will review with CONTRACTOR the DESIGN PROFESSIONAL'S preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an application for payment or otherwise). DESIGN PROFESSIONAL'S written decision thereon will be final and binding upon CITY and CONTRACTOR, unless, within ten days after the date of any such decision, either CITY or CONTRACTOR delivers to the other and to DESIGN PROFESSIONAL written notice of intention to appeal from DESIGN PROFESSIONAL'S decision and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction to exercise such rights or remedies as the appealing party may have with respect to DESIGN PROFESSIONAL'S decision, unless otherwise agreed in writing by CITY and CONTRACTOR. Such appeal will not be subject to the procedures of paragraph 8.8.
- 8.8 DECISIONS ON DISPUTES: DESIGN PROFESSIONAL will be the initial interpreter of the requirements of the CONTRACT DOCUMENTS and judge of the acceptability of the WORK thereunder. Claims, disputes and other matters relating to the acceptability of the WORK or the interpretations of the requirements of the CONTRACT DOCUMENTS pertaining to the performance and furnishing of the WORK and claims under Article 11 in respect of changes in the CONTRACT PRICE or CONTRACT TIMES will be referred initially to DESIGN PROFESSIONAL in writing with a request for formal decision in accordance with this paragraph. Written notice of each such claim, dispute or other matter will be delivered by the claimant to DESIGN PROFESSIONAL and the other party to the AGREEMENT promptly (but in no event later than thirty days) after the start of the occurrence or event giving rise thereto, and written supporting data will be submitted to DESIGN PROFESSIONAL and the other party within sixty days after the start of such occurrence or event unless DESIGN PROFESSIONAL allows an additional period of time for the submission of additional or more accurate data in support of such claim, dispute or other matter. The opposing party shall submit any response to DESIGN PROFESSIONAL and the claimant within thirty days of the last submittal (unless DESIGN PROFESSIONAL allow an additional time). DESIGN PROFESSIONAL will render a formal decision in writing within thirty days after receipt of the opposing party's submittal, if any, in accordance with this paragraph. DESIGN PROFESSIONAL'S written decision on such claim, dispute or other matter will be final and binding upon CITY and CONTRACTOR unless a written notice of intention to appeal from DESIGN PROFESSIONAL'S written decision is delivered by CITY or CONTRACTOR to the other and to DESIGN PROFESSIONAL within thirty days after the date of such decision and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction to exercise such rights or remedies as the appealing party may have with respect of such claim, dispute or other matter in accordance with applicable laws and regulations within sixty days of the date of such decision, unless otherwise agreed in writing by CITY and CONTRACTOR.
- 8.9 IMPARTIALITY: When functioning as interpreter and judge under paragraphs 8.7 and 8.8, DESIGN PROFESSIONAL will not show partiality to CITY or CONTRACTOR and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

The rendering of a decision by DESIGN PROFESSIONAL pursuant to paragraphs 8.7 and 8.8 with respect to any such claim, dispute or other matter (except any which have been waived by the making or acceptance of final payment) will be a condition precedent to any exercise by CITY or CONTRACTOR of such rights or remedies as either may otherwise have under the CONTRACT DOCUMENTS or by laws or regulations in respect of any such claim, dispute or other matter.

- 8.10 LIMITATIONS ON DESIGN PROFESSIONAL'S AUTHORITY AND RESPONSIBILITIES: Neither DESIGN PROFESSIONAL'S authority or responsibility under this Section 8 or under any other provision of the CONTRACT DOCUMENTS nor any decision made by DESIGN PROFESSIONAL in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise or performance of any authority or responsibility by DESIGN PROFESSIONAL shall create, impose or give rise to any duty owed by DESIGN PROFESSIONAL to CONTRACTOR, any SUBCONTRACTOR, any SUPPLIER, any other person or organization, or to any surety for or employee or agent of any of them.
- 8.10.1 DESIGN PROFESSIONAL will not supervise, direct, control or have authority over or be responsible for CONTRACTOR'S means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incidental thereto, or for any failure of CONTRACTOR to comply with law and regulations applicable to the furnishing or performance of the WORK. DESIGN PROFESSIONAL will not be responsible for CONTRACTOR'S failure to perform or furnish the WORK in accordance with the CONTRACT DOCUMENTS.
- 8.10.2 DESIGN PROFESSIONAL will not be responsible for the acts or omissions of CONTRACTOR or of any SUBCONTRACTOR, and SUPPLIER, or of any other person or organization performing or furnishing any of the WORK.
- 8.10.3 DESIGN PROFESSIONAL'S review of the final application for payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds and certificates of inspection, tests and approvals and other documentation required to be delivered by these CONTRACT DOCUMENTS will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests and approvals that the results certified indicate compliance with the CONTRACT DOCUMENTS.
- 8.10.4 The limitations upon authority and responsibility set forth in this Section 8 shall also apply to DESIGN PROFESSIONAL'S, Resident Project Representative, assistants and professional consultants.

END OF SECTION 8

DIVISION 1

General Provisions

Section 9

City's Responsibility

- 9.1 Method of Communications
- 9.2 Termination of DESIGN PROFESSIONAL
- 9.3 Processing Payments
- 9.4 Lands, Rights-of-way, Easements
- 9.5 CHANGE ORDERS
- 9.6 SAMPLES and Tests
- 9.7 Stop WORK, Suspend
- 9.8 Prosecution of the WORK

- 9.1 METHOD OF COMMUNICATIONS: Except as otherwise provided in these General Provisions, the CITY shall issue all communications to the CONTRACTOR through the DESIGN PROFESSIONAL.
- 9.2 TERMINATION OF DESIGN PROFESSIONAL: In the case of termination of the employment of the DESIGN PROFESSIONAL, the CITY shall appoint an DESIGN PROFESSIONAL against whom CONTRACTOR makes no reasonable objection, whose status under the CONTRACT DOCUMENTS shall be that of the former DESIGN PROFESSIONAL.
- 9.3 PROCESSING PAYMENTS: The CITY shall make payments to the CONTRACTOR in accordance with Section 12.1 and 12.1.1.
- 9.4 LANDS, RIGHTS-OF-WAY, EASEMENTS: The CITY shall make available to the CONTRACTOR such lands and rights-of-way or easements, as specified in Section 5.1 and exploratory reports set forth in Section 5.2. In addition, the CITY, through the DESIGN PROFESSIONAL, will provide reference points and construction stakes as provided in Section 5.5.
- 9.5 CHANGE ORDERS: When the DESIGN PROFESSIONAL and the CONTRACTOR agree that a CHANGE ORDER is required due to changes in CONTRACT PRICE or CONTRACT TIME, the DESIGN PROFESSIONAL shall process such documents as may be required to process the CHANGE ORDER promptly as provided in Section 4.3 of these General Provisions.
- 9.6 SAMPLES AND TESTS: The CITY'S responsibility in respect to certain Tests and SAMPLES is set forth in Section 7.8 of these General Provisions.
- 9.7 STOP WORK, SUSPEND WORK, TERMINATE SERVICES: The CITY reserves the right to Stop WORK, Suspend WORK or Terminate Services under certain circumstances as provided by these General Provisions.
- 9.8 PROSECUTION OF THE WORK: The CITY shall not supervise, direct, control nor have authority over the CONTRACTOR'S means, method, techniques, sequences or procedures of construction.

END OF SECTION 9

## DIVISION 1

### General Provisions

#### Section 10

#### Change in Contract Time

- 10.1 Change in CONTRACT TIME
  - 10.2 Delays
  - 10.3 Temporary Supervision of WORK
  - 10.4 Extension of CONTRACT TIME
  - 10.5 Failure to Complete WORK on Time
- 10.1 CHANGE IN CONTRACT TIME: The CONTRACT TIME may be changed only by CHANGE ORDER or WRITTEN AMENDMENT within the guidelines of the CITY COUNCIL Policy. Any claim for an adjustment of CONTRACT TIME shall be based on a written notice by the CONTRACTOR to the DESIGN PROFESSIONAL not later than thirty (30) days after the occurrence of the event giving rise to the claim. Written justification of the extent of the claim shall be delivered to the DESIGN PROFESSIONAL within sixty (60) days of such occurrence. All claims for adjustments to CONTRACT TIME shall be determined in accordance with Sections 1.51, 3.11, 4.2, 4.4, 4.8, 8.1, 9.5, 9.7 and 11.4.
- 10.2 DELAYS: Where the CONTRACTOR is prevented from completing any part of the WORK within the CONTRACT TIME due to delay beyond the control of the CONTRACTOR, the CONTRACT TIME will be extended in an amount equal to the time lost due to such delay. Delays beyond the control of the CONTRACTOR shall include, but not be limited to, acts or neglect by the CITY, acts or neglect of utility owners, fires, floods, epidemics, abnormal weather conditions or acts of God. Delays attributable to and within the control of a SUBCONTRACTOR or SUPPLIER shall be deemed to be delays within the control of the CONTRACTOR.
- 10.3 TEMPORARY SUSPENSION OF WORK: The DESIGN PROFESSIONAL shall have the authority to suspend the WORK wholly or in part. The order to suspend the WORK for periods exceeding one (1) day shall be in writing and shall include the specific reasons for suspension.
- 10.3.1 If the WORK is suspended by the DESIGN PROFESSIONAL because of the failure or refusal of the CONTRACTOR to comply with the order of the DESIGN PROFESSIONAL or with the DRAWINGS and SPECIFICATIONS, the time elapsed during such suspension shall remain charged against the CONTRACTOR.
- 10.3.2 When the WORK is suspended, the CONTRACTOR shall store all material in such manner that they will not obstruct or impede the traveling public unnecessarily nor become damaged in any way and he shall take every precaution to prevent damage or deterioration of the WORK performed. The WORK shall be resumed when conditions are favorable, and methods are corrected as ordered or approved in writing by the DESIGN PROFESSIONAL. Liquidated damages shall not accrue during the period in which WORK is suspended unless suspension is due to the failure of the CONTRACTOR to perform any of the provisions of the CONTRACT.
- 10.3.3 If the WORK is suspended by the CITY in order to remove or replace unknown subsurface hazards or utilities or to correct funding deficiencies caused by said conditions, the time elapsed during such suspension shall not be charged against the CONTRACTOR. In addition, the CONTRACTOR may claim partial remobilization cost if the suspension exceeds five (5) working days as defined elsewhere in these General Provisions.

- 10.4 EXTENSION OF CONTRACT TIME: The date of beginning and the time of completion of the WORK are essential conditions of the CONTRACT DOCUMENTS and the WORK embraced shall be commenced on the date specified in the NOTICE TO PROCEED.
- 10.4.1 The CONTRACTOR will proceed with the WORK at such rate of progress to insure full completion within the CONTRACT TIME. It is expressly understood and agreed, by and between the CONTRACTOR and the CITY, that the CONTRACT TIME for the completion of the WORK described herein is a reasonable time, taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the WORK.
- 10.4.2 In the event there is an overrun in the contractual amount, the CONTRACT TIME shall automatically be extended by a period proportional to the positive difference in dollars obtained by subtracting the CONTRACT amount from the total amount of the final estimate.
- 10.5 FAILURE TO COMPLETE WORK ON TIME: Should the CONTRACTOR fail to complete the WORK within the CONTRACT TIME or extension of time granted by the CITY, the CONTRACTOR will pay to the CITY the amount for liquidated damages as specified in the BID for each WORKING DAY that the CONTRACTOR shall be delinquent after the time stipulated in the CONTRACT DOCUMENTS.
- 10.5.1 An amount of **\$250.00** per CALENDAR DAY, for each day after the expiration of the CONTRACT TIME or extended CONTRACT TIME, will be deducted as liquidated damages from any money due the CONTRACTOR under this CONTRACT. The CONTRACTOR and his SURETY shall be liable for any liquidated damages in excess of the amount due the CONTRACTOR. Liquidated damages will be deducted from the CONTRACTOR'S partial estimate when CONTRACT TIME expires, and funds deducted may only be paid to the CONTRACTOR for liquidated damages upon approval of additional CALENDAR DAYS to his CONTRACT TIME and payment made for only those additional CALENDAR DAYS approved.
- 10.5.2 Permitting the CONTRACTOR to continue and finish the WORK or any part of it after the time affixed for its completion, or after the date to which the time of completion may have been extended, shall in no way be considered as a waiver on the part of the CITY of any of its rights under this AGREEMENT.

END OF SECTION 10

DIVISION 1

General Provisions

Section 11

Changes in Contract Price

- |      |                           |      |                                   |
|------|---------------------------|------|-----------------------------------|
| 11.1 | CONTRACT PRICE            | 11.3 | Value of WORK                     |
| 11.2 | Changes in CONTRACT Price | 11.4 | Increased or Decreased Quantities |

11.1 CONTRACT PRICE: The CONTRACT PRICE constitutes the total compensation (subject to authorized adjustments) payable to the CONTRACTOR for performing the WORK. All duties, responsibilities and obligations assigned to or undertaken by the CONTRACTOR shall be at the CONTRACTOR'S expense without change in the CONTRACT PRICE.

11.2 CHANGES IN CONTRACT PRICE: The CONTRACT PRICE may be changed only by a CHANGE ORDER or by a WRITTEN AMENDMENT. Any claim for an adjustment in the CONTRACT PRICE shall be based on written notice delivered by the CONTRACTOR to the DESIGN PROFESSIONAL promptly (but in no event later than thirty (30) days) after the start of the occurrence or event giving rise to the claim and stating the general nature of the claim. Notice of the amount of the claim with supporting data shall be delivered within sixty (60) days after the start of such occurrence or event (unless DESIGN PROFESSIONAL allows additional time for claimant to submit additional or more accurate data in support of the claim) and shall be accompanied by claimant's written statement that the adjustment claimed covers all known amounts to which the claimant is entitled as a result of said occurrence or event. All claims for adjustment in the CONTRACT PRICE shall be determined by DESIGN PROFESSIONAL but final approval shall not be formally constituted until final action of approval by the CITY COUNCIL.

11.3 VALUE OF WORK: The CONTRACT PRICE may be changed only by a CHANGE ORDER. The value of any WORK covered by a CHANGE ORDER or of any claim for increase or decrease in the CONTRACT PRICE shall be determined by one or more of the following methods in the order of precedence listed below:  
Method (A) - By agreed unit prices; or  
Method (B) - By agreed lump sum; or  
Method (C) - If neither Method (A) nor Method (B) can be agreed upon before the Extra WORK is commenced, then the CONTRACTOR shall be paid the "Actual Field Cost" of the WORK plus twenty percent (20%).

11.3.1 When the CITY requires the CONTRACTOR to do such work on a force account basis, the CONTRACTOR will be compensated as follows:

(a) LABOR: For labor and working foremen in direct charge of operations, the CONTRACTOR shall receive the wage rates agreed upon in writing before beginning WORK for each hour that said labor and foremen are engaged in such WORK. The CONTRACTOR shall receive the actual costs paid to, or in behalf of, workmen for subsistence and travel allowances, health and welfare benefits, pension fund benefits or other benefits when such amounts are required by collective bargaining agreement or other employment contract generally applicable to the classes of labor employed on the WORK, but limited to a maximum daily rate for subsistence and travel allowances, which maximum will be agreed upon prior to incurring such charges. An amount equal to twenty percent (20%) of the sum of the above items will also be paid the CONTRACTOR.

- (b) BOND, INSURANCE AND TAX: For property damage, liability and workmen's compensation insurance premiums, unemployment insurance contributions and social security taxes on force account work, the CONTRACTOR shall receive the actual cost thereof, to which six percent (6%) will be added. The CONTRACTOR shall furnish satisfactory evidence of the rates paid for such BOND, insurance and tax.
- (c) MATERIALS: For materials accepted by the DESIGN PROFESSIONAL and used, the CONTRACTOR shall receive the actual cost of such materials delivered on the WORK including transportation charges paid by him (exclusive of machinery rentals), to which fifteen percent (15%) will be added.
- (d) EQUIPMENT: For machinery or special equipment (other than small tools) including fuel, lubricants and transportation costs, the use of which has been authorized by the DESIGN PROFESSIONAL, the CONTRACTOR shall receive the rental rates agreed upon in writing before such WORK is begun for the actual time such equipment is in operation on the WORK.
- (e) MISCELLANEOUS: No additional allowance will be made for General Superintendence, the use of small tools or other costs for which no specific allowance is herein provided.
- (f) COMPENSATION: The PROJECT REPRESENTATIVE and the DESIGN PROFESSIONAL shall compare records of the cost of WORK done as ordered on a force account basis. Such comparison shall be made daily if required by the DESIGN PROFESSIONAL. Should any work be performed by an approved SUBCONTRACTOR, the CONTRACTOR will be paid the actual and reasonable cost of such subcontracted work computed as outlined above, plus an additional allowance of ten percent (10%) for materials cost and for direct labor cost to cover the CONTRACTOR's profit, superintendent, administration, insurance and overhead.
- (g) STATEMENTS: No payment will be made for WORK performed on a force account basis until the CONTRACTOR has furnished the DESIGN PROFESSIONAL with duplicate itemized statements of the cost of such force account work detailed as follows:
  - (1) Name, classification, date, daily hours, total hours, rate and extension for each laborer and foreman.
  - (2) Designations, dates, daily hours, total hours, rental rate and extension for each unit of machinery and equipment.
  - (3) Quantities of materials, prices and extensions.
  - (4) Transportation of materials.
  - (5) Cost of property damage, liability and workmen's compensation insurance premiums, unemployment insurance contributions and social security tax.

Statements shall be accompanied and supported by invoices for all materials used and all transportation charges. If materials used on force account work are not purchased for such work but are taken from the CONTRACTOR's stock, in lieu of invoices, the CONTRACTOR shall furnish an itemized list of such materials showing that the quantity claimed was actually used, and that the price and transportation costs claimed represent the actual cost to the CONTRACTOR. All invoices submitted shall be accompanied by the CONTRACTOR's notarized statement that payment in full has been made for the materials.

- 11.4 INCREASED OR DECREASED QUANTITIES: When alterations in DRAWINGS or quantities of WORK not requiring SUPPLEMENTAL AGREEMENTS, as hereinabove provided, are ordered and performed and when such alterations result in increase or decrease of the quantity of WORK performed, the CONTRACTOR shall accept payment in full at the CONTRACT Unit Price for the actual quantities of WORK done and no allowance will be made for anticipated profits. Increased or decreased quantities of WORK involving CONTRACT PRICE changes, as set forth in Sections 8 and 11 of the General Provisions shall be paid for as stipulated in such agreements.

END OF SECTION 11



DIVISION 1

General Provisions

Section 12

Payments and Completion

12.1	Progress Payments	12.5	Acceptance and Final Payment
12.2	Scope of Payments	12.6	Waiver of Claims
12.3	Final Cleaning Up	12.7	CONTRACTOR'S Guarantee
12.4	Final Inspection		

12.1 PROGRESS PAYMENTS: On or before the last day of each month, the CONTRACTOR shall prepare and submit to the DESIGN PROFESSIONAL for approval or modification, a monthly statement or estimate showing as completely as practical the total value of the WORK done by the CONTRACTOR up to the last day of the month; said estimate shall also include the value of all stockpiled materials delivered on the SITE and accepted by the DESIGN PROFESSIONAL.

12.1.1 The CITY shall then pay the CONTRACTOR within thirty (30) days the total amount of the approved estimate, less retainage as required per LA Revised Statutes 38:2248, and further less all previous payments and further sums that may be retained by the CITY under the terms of the CONTRACT.

12.2 SCOPE OF PAYMENTS: The CONTRACTOR shall receive and accept the compensation provided for in the CONTRACT as full payment for furnishing all materials, labor, tools and equipment and for performing all WORK contemplated and embraced under the CONTRACT in a complete and acceptable manner in accordance with the CONTRACT, for all loss or damage arising out of the nature of the WORK as herein specified, or from any unforeseen difficulties or obstructions which may arise or be encountered during the prosecution of the WORK and for all risks of every description connected with the prosecution of the WORK until final acceptance by the DESIGN PROFESSIONAL. The payment of any Progress Payment or the acceptance of any portion of the WORK as provided in the CONTRACT shall in no way affect the obligation of the CONTRACTOR, who, at his own cost and expense, shall repair, correct, renew or replace any defects or imperfections in the construction, strength, or quality of materials used in or about the construction of the WORK under the CONTRACT and this payment shall in no way affect his responsibility for all damages due or attributable to such defects or imperfections which may be discovered before the final acceptance of the whole WORK and the DESIGN PROFESSIONAL shall be the judge of such defects or imperfections. No monies under the CONTRACT shall become due, if the DESIGN PROFESSIONAL so elects, until the CONTRACTOR has satisfied the DESIGN PROFESSIONAL that he has fully settled for materials, equipment and other services in or upon the WORK and labor done in connection therewith.

12.2.1 All WORK indicated on the DRAWINGS as necessary to the completion of the improvement shall be performed by the CONTRACTOR, unless otherwise provided. All fences, buildings, bridges and structures of any character not necessary to the construction of the PROJECT or other encumbrances upon or within the limits of the construction, where indicated on the DRAWINGS to be removed, unless otherwise provided, shall be removed by the CONTRACTOR and disposed of as directed. All unsightly material removed shall be disposed of in such a manner that meets the approval of the DESIGN PROFESSIONAL. This WORK will be paid for as specifically provided for in the various pay items appearing in the proposal and CONTRACT, but should no specific provisions be made for the payment of this WORK, it will be considered subsidiary WORK and as such shall be included by the CONTRACTOR in the BID prices for pay items appearing in the proposal and CONTRACT.

- 12.3 FINAL CLEANING UP: Upon completion of the WORK and before acceptance and final payment is made, the CONTRACTOR shall clean and remove from the roadway, neutral ground and adjacent property all surplus and discarded materials, weeds, bushes, rubbish, forms and temporary structures. He shall restore in an acceptable manner all property, both public and private, which has been damaged during the prosecution of the WORK, and shall leave the site of the WORK in a neat and presentable condition throughout.
- 12.3.1 Upon completion, and unless otherwise instructed, structures, all superfluous material, cofferdams, construction buildings and other temporary structures and debris resulting from construction shall be removed. False work timbers and piles shall be removed to the ground level. Upon completion of WORK in connection with drainage structures, the CONTRACTOR will be required to remove all debris, such as drifts, weeds, dirt, scraps of building material, or any other obstruction whether old or new.
- 12.3.2 All drainage culverts within the limits of the PROJECT shall be cleaned and flushed whether it is new culverts installed in the PROJECT or culverts found in place and/or designated by the DESIGN PROFESSIONAL to remain.
- 12.3.3 All materials shall be disposed of as directed by the DESIGN PROFESSIONAL and stream channels, structures and roadway shall be left in a neat and presentable condition. Obstructions to the end of drainage structures shall be removed unless the CONTRACTOR is otherwise directed by the DESIGN PROFESSIONAL.
- 12.3.4 No special payment will be made for this work; its cost being included in the prices paid for the construction work.
- 12.4 FINAL INSPECTION: Whenever the WORK provided for and contemplated by the CONTRACT shall have been satisfactorily completed and the final cleaning up performed, the CONTRACTOR shall notify the DESIGN PROFESSIONAL, requesting Final Inspection.
- 12.5 ACCEPTANCE AND FINAL PAYMENT: Within ten (10) days after the CONTRACTOR has given notice to the DESIGN PROFESSIONAL that the WORK has been completed, the DESIGN PROFESSIONAL and the PROJECT REPRESENTATIVE shall inspect the WORK and within said time, if the WORK is found to be completed in accordance with the CONTRACT DOCUMENTS, the DESIGN PROFESSIONAL shall provide to the CITY a CERTIFICATE OF ACCEPTANCE. Upon completion of all WORK, and upon certification by the CITY that the WORK has been accepted, the CITY will record the CERTIFICATE OF ACCEPTANCE of the WORK in the office of the Clerk of Court of Rapides Parish, Louisiana. If, upon or after the expiration of forty-five (45) days after the recordation of acceptance, the CONTRACTOR submits to the CITY a Certificate from the Clerk of Court of the Parish of Rapides to the effect that there are no claims or liens recorded against the CONTRACT or the CONTRACTOR, then Final Payment of all amounts due the CONTRACTOR shall be made by the CITY. Final Payment will be made within thirty (30) days of receipt of the Clear Lien Certificate from the CONTRACTOR through the DESIGN PROFESSIONAL. Neither the CERTIFICATE OF ACCEPTANCE nor the Final Payment, nor any provision in the CONTRACT DOCUMENTS shall relieve the CONTRACTOR of the obligations for fulfillment of any warranty that may be required in these General Provisions, the SPECIAL PROVISIONS or the SPECIFICATIONS.
- 12.6 WAIVER OF CLAIMS: The acceptance by the CONTRACTOR of Final Payment shall be and shall operate as a release to the CITY of all claims and all liability to the CONTRACTOR, other than claims in stated amount as may be specifically accepted by the CONTRACTOR, for all things done or furnished in connection with this WORK and for every act and neglect of the CITY and others relating to or arising out of this WORK. Any payment, however, final or otherwise, shall not release

the CONTRACTOR or its SURETIES from any obligations under the CONTRACT DOCUMENTS or the Performance and Payment BONDS.

- 12.7 CONTRACTOR'S GUARANTEE: The CONTRACTOR shall guarantee all materials and equipment furnished and WORK for a period of one (1) year from the date of recordation of the CERTIFICATE OF ACCEPTANCE. The CONTRACTOR warrants that the completed WORK is free from all defects due to faulty materials and workmanship and the CONTRACTOR shall promptly make such corrections as may be necessary by reason of such defects including the repairs of the damage of other parts of the system resulting from such defects. The CITY will give notice of observed defects with reasonable promptness. In the event that the CONTRACTOR should fail to make such repairs, adjustments, or other WORK that may be made necessary by such defects, the CITY may do so and charge the CONTRACTOR the cost thereby incurred. The Performance BOND shall remain in full force and effect through the guaranty period.

END OF SECTION 12

## DIVISION 1

### General Provisions

#### Section 13

##### Termination and Default

- 13.1 Termination
- 13.2 CONTRACTOR May Terminate
- 13.3 Default of CONTRACT
- 13.4 Termination of CONTRACTOR'S Responsibility

13.1 TERMINATION: The CITY may elect to terminate an AGREEMENT with a CONTRACTOR when the CONTRACTOR persistently fails to perform the WORK in accordance with the CONTRACT DOCUMENTS. Such failure shall include, but not be limited to failure to supply sufficient skilled workers or suitable material or equipment or failure to adhere to progress schedules; failure to obey LAWS AND REGULATIONS; failure to regard the authority of the DESIGN PROFESSIONAL; or failure to comply in a substantial way with the provisions of the CONTRACT DOCUMENTS.

13.1.1 The CITY may, after giving CONTRACTOR and the SURETY, seven (7) days written notice and to the extent permitted by LAWS AND REGULATIONS, terminate the services of CONTRACTOR, exclude CONTRACTOR from the Site and take possession of the WORK and of all CONTRACTOR's tools, appliances, construction equipment and machinery at the Site and use the same to the full extent they could be used by CONTRACTOR (without liability to CONTRACTOR for trespass or conversion), incorporate in the WORK all materials and equipment stored at the Site or for which the CITY has paid CONTRACTOR but which are stored elsewhere, and finish the WORK as the CITY may deem expedient. In such case CONTRACTOR shall not be entitled to receive any further payment until the WORK is finished. If the unpaid balance of the CONTRACT PRICE exceeds all claims, costs, losses and damages sustained by the CITY arising out of or resulting from completing the WORK such excess will be paid to CONTRACTOR. If such claims, costs, losses and damages exceed such unpaid balance, CONTRACTOR shall pay the difference to the CITY. Such claims, costs, losses and damages incurred by the CITY will be reviewed by DESIGN PROFESSIONAL as to their reasonableness and when so approved by DESIGN PROFESSIONAL incorporated in a CHANGE ORDER, provided that when exercising any rights or remedies under this paragraph the CITY shall not be required to obtain the lowest price for the WORK performed.

13.1.2 Where Contractor's services have been so terminated by the CITY, the termination will not affect any rights or remedies of the CITY against CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of monies due CONTRACTOR by the CITY will not release CONTRACTOR from liability.

13.1.3 Upon seven (7) days' written notice to CONTRACTOR the CITY may, without cause and without prejudice to any other right or remedy of the CITY, elect to terminate the AGREEMENT. In such case, CONTRACTOR shall be paid (without duplication of any items):

13.1.3.1 For completed and acceptable WORK executed in accordance with the CONTRACT DOCUMENTS prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such WORK.

13.1.3.2 For expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials or equipment as required by the CONTRACT DOCUMENTS in

connection with uncompleted WORK, plus fair and reasonable sums for overhead and profit on such expenses.

- 13.1.3.3 For all claims, costs, losses and damages incurred in settlement of terminated contracts with SUBCONTRACTORS, SUPPLIERS and others; and
- 13.1.3.4 For reasonable expenses directly attributable to termination.
- 13.1.4 CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.
- 13.2 CONTRACTOR MAY TERMINATE: If, through no act or fault of CONTRACTOR, the WORK is suspended for a period of more than ninety (90) days by the CITY or under an order of court or other public authority, or DESIGN PROFESSIONAL fails to act on any Application for Payment within thirty (30) days after it is submitted or the CITY fails for thirty (30) days to pay CONTRACTOR any sum finally determined to be due, then CONTRACTOR may, upon seven (7) days' written notice to the CITY and provided the CITY or DESIGN PROFESSIONAL do not remedy such suspension or failure within that time, terminate the AGREEMENT and recover from the CITY payment on the same terms as provided in Section 13.1.3.1, 13.1.3.2, 13.1.3.3, 13.1.3.4 and 13.1.4.
- 13.3 DEFAULT OF CONTRACT: If the CONTRACTOR fails to begin WORK within the time specified or if the construction or WORK to be done under this CONTRACT shall be abandoned, or if this CONTRACT, or any part thereof, shall be sublet without the previous written consent of the DESIGN PROFESSIONAL, or if the CONTRACT shall be assigned by the CONTRACTOR otherwise than as specified, or if at any time the DESIGN PROFESSIONAL shall be of the opinion that the WORK or any part thereof is unnecessarily or unreasonably delayed or that the CONTRACTOR has violated any provisions of this CONTRACT; or if the CONTRACTOR shall discontinue the prosecution of the WORK without authority; or shall become insolvent or be declared bankrupt, or shall commit any act of bankruptcy, or insolvency, the DESIGN PROFESSIONAL may give notice in writing to the CONTRACTOR and his SURETY of such delay, neglect or default, specifying the same. If the CONTRACTOR within a period of ten (10) days after such notice shall not proceed in accordance therewith, then the CITY shall upon written certificate from the DESIGN PROFESSIONAL of the fact of such delay, neglect or default of the CONTRACTOR'S failure to comply with such notice, have full power and authority, without violating the CONTRACT, to take the prosecution of the WORK out of the hands of the CONTRACTOR and to appropriate or use any and all materials and equipment on the ground as may be suitable and acceptable and enter into an AGREEMENT for the completion of the CONTRACT according to the terms and provisions thereof or use such other methods as in his opinion may be required for the completion for the CONTRACT in an acceptable manner.
- 13.3.1 All costs and charges that may be incurred under this article or any damages that should be borne by the CONTRACTOR, shall be withheld or deducted from any monies then due or to become due the CONTRACTOR, under this CONTRACT or any part thereof; and in such accounting the CITY shall not be held to obtain the lowest cost of the WORK for completing the CONTRACT or any part thereof, but all sums actually paid therefor shall be charged to the CONTRACTOR. In case the costs and charges incurred are less than the sum that would have been payable under the CONTRACT, if the same had been completed by the CONTRACTOR, the CONTRACTOR or his SURETY shall be entitled to receive the difference and in case such costs and charges exceed the said sum, the CONTRACTOR or his SURETY shall pay the amount of excess to the CITY for the completion of the WORK.

- 13.4 TERMINATION OF CONTRACTOR'S RESPONSIBILITY: The CONTRACT will be considered complete when all WORK has been satisfactorily completed, the Final Inspection made, the WORK accepted by the DESIGN PROFESSIONAL and the CITY. The CONTRACTOR will then be released from further obligation except as set forth in his CONTRACT DOCUMENTS.

END OF SECTION 13

END OF GENERAL PROVISIONS

**SUPPLEMENTARY PROVISIONS / SPECIAL CONDITIONS**

**RE-BID: 2024 BUILDING RENOVATIONS: CITY OF ALEXANDRIA SWAT BUILDING**

**BC-2024-01**

**OWNER: CITY OF ALEXANDRIA, LOUISIANA**

ARTICLE 1 – GENERAL

Additional supplementary conditions are listed in Section 00200. All instructions which are not amended or supplemented remain in force and effect.

ARTICLE 2 - AMMENDMENTS OR SUPPLEMENTS

1.01 Throughout these specifications and in the City of Alexandria Standard General Provisions, reference to DESIGN PROFESSIONAL shall be amended to read OWNER’S REPRESENTATIVE as designated in the CONSTRUCTION CONTRACT.

1.02 Contractor’s Contractual and OWNER’S Protective Liability Insurance Limits: The following minimum limits and special requirements shall be applicable to insurance specified in Section 6 of Alexandria Standard General Provisions.

A. Worker’s Compensation and Employers’ Liability: The liability limits shall not be less than:

Worker’s Compensation...Statutory Limits

Employer’s Liability.....\$500,000 each occurrence or disease and in aggregate

B. Commercial General Liability: The liability limits shall not be less than:

General Aggregate.....\$1,000,000

Products-Comp.....\$1,000,000

Personal and Advance Injury.....\$1,000,000

Each Occurrence.....\$1,000,000

Fire Damage (any one fire).....\$50,000

Medical Expense (any one person).....\$5,000

C. Automobile Liability:

D. The liability limits shall not be less than: Any Auto Combined Single Limit. \$1,000,000

E. General Liability – OWNER’S and CONTRACTOR’S Protective Liability:

General Aggregate.....\$1,000,000

Products-Comp./Op. Aggregate.....\$1,000,000

Personal and Advanced Injury.....\$1,000,000

Each Occurrence.....\$1,000,000

- F. Hold Harmless and Indemnify: The CONTRACTOR agrees to indemnify, hold harmless and defend the OWNER and his agents, DESIGN PROFESSIONALS, and employees while acting within the scope of their duties from and against any and all liability, claims, damages and cost of defense arising out of the CONTRACTOR'S performance of the work described herein but not including the sole negligence of the OWNER, his agents, DESIGN PROFESSIONALS, or employees. The CONTRACTOR will require any and all subcontractors to conform with the provisions of this clause prior to commencing any work and agrees to include this clause into each insurance binder.
  - G. Certificates of Insurance: Certificates indicating and certifying to insurance coverages provided for the Work shall be provided and approved prior to execution of contract.”
- 1.03 Section 13 of the City of Alexandria Standard General Provisions, is appended with the following Article 13.5:
- A. 13.5 DURATION OF AGREEMENT: For the purposes of this section, the mayor is authorized to terminate this contract without further City Council approval.

**END OF SECTION**



# 1 General Requirements

01010	SUMMARY OF WORK
01027	APPLICATIONS FOR PAYMENT
01040	COORDINATION
01050	FIELD ENGINEERING
01090	DEFINITIONS AND STANDARDS
01200	PROJECT MEETINGS
01300	SUBMITTALS
01400	QUALITY CONTROL
01500	TEMPORARY FACILITIES AND CONTROLS
01600	MATERIAL AND EQUIPMENT
01700	CONTRACT CLOSEOUT

## 01010 SUMMARY OF WORK

### General

#### A. Work Covered by Contract Documents:

1. Owner: City of Alexandria
2. Contract Documents: All work shall be based on existing site conditions and Contract Documents marked BC2024-01, prepared by the City of Alexandria; Braddock Companies, LLC., 4024 Jackson St., Alexandria, LA 71303, (318) 704-4393. The Contract Documents are as follows:
  - a. City of Alexandria Front End Documents.
  - b. Specifications, Divisions 1 through 16.
  - c. Drawings, as defined in 01010 E.
  - d. Addenda, issued during bid period.
3. **Base Bid:** Interior and Exterior Renovations : The Work of the Base Bid includes but is not necessarily limited to : Removal and replacement of the roof system to a fully adhered PVC tapered system. Remove all exterior windows on the first and second floors and replace with storefront system, remove all sliding doors at balconies and replace with storefront and entry systems. Restore damaged area of concrete frame and recoat. Apply masonry water repellent to existing brick masonry. Exterior painting of all existing painted surfaces including railings and ladders. New aluminum balcony railings on front balconies. Change out existing glass sectional doors to new insulated sectional overhead doors. Reuse existing tracks and motor drives. New interior finishes, new gyp.bd. walls and ceilings. New VCT floors. Cleaning of existing ductwork and HVAC units. New doors and hardware throughout interior. New lighting. Change out existing plumbing fixtures and new trim. New ceramic wall tile over existing tile in upstairs toilet rooms. The building has now undergone removal of all existing materials possibly containing asbestos. As a result, much of the interior finish demolition has already been done. All wall and ceiling gypsum board and all VAT floor tile and glue has been removed.
4. **Alternate No. 1:** Not Applicable

- B. Contract:** The Owner anticipates the award of one (1) lump sum Contract for the Base Bid and Alternate Bids (if applicable). The Contractor shall have the undivided responsibility for performance of all the Work.

#### C. Contractor Use of Premises:

1. Limit use of premises for Work to areas designated for work items. Adequate area shall be designated for construction, storage, and parking.
2. Limit access to Work area from unauthorized persons.
3. Protect existing site from damage as much as possible.
4. Remove debris and keep construction, parking and storage areas and used portion of site clean.
5. Coordinate the scheduling of work with the Owner.

**D. Owner Occupancy:**

1. General: The Owner reserves the right to access areas around the building site during the construction period. The Owner will not occupy the building during construction. Cooperate with the Owner during construction operations to minimize conflicts and facilitate Owner access to surrounding buildings. Perform the Work so as not to interfere with the Owner's operations.

**E. Contract Drawings:** The Contract Drawings (24" x 36" Drawing Sheets) are listed on the *Title Sheet* of the Drawings.ARCHITECTURAL:

A001 - TITLE SHEET  
A101 - SITE PLAN  
A201 - DEMOLITION FLOOR PLAN  
A202 - PHOTOS OF EXISTING CONDITIONS  
A203 - NEW ROOF PLAN  
A204 - REFLECTED CEILING PLAN  
A301 - ROOF PLAN  
A401 - DEMOLITION EXTERIOR ELEVATIONS  
A402 - EXTERIOR PHOTOS, DETAIL AND ROOM FINISH SCHEDULE  
A403 - NEW EXTERIOR ELEVATIONS  
A501 - BUILDING SECTIONS  
A601 - WALL SECTIONS  
A701 - INTERIOR ELEVATIONS & DETAILS  
A801 - COLUMN/ROOF DETAILS  
A802 - MISCELLANEOUS ROOF DETAILS  
A803 - BALCONY RAILING DETAILS  
A804 - WINDOW DETAILS & ELEVATIONS  
A805 - DOOR ELEVATIONS & SCHEDULE

MECHANICAL:

M001 - MECHANICAL LEGEND AND NOTES  
M101 - MECHANICAL PLAN  
M201 - MECHANICAL SCHEDULES AND DETAILS

PLUMBING:

P001 - PLUMBING LEGEND AND NOTES  
P101 - PLUMBING DEMOLITION PLAN  
P201 - PLUMBING PLAN  
P301 - PLUMBING SCHEDULE AND DETAILS

ELECTRICAL:

E001 - ELECTRICAL LEGEND  
E101 - ELECTRICAL DEMOLITION PLAN  
E201 - ELECTRICAL DEMOLITION PLAN  
E301 - LIGHTING PLAN  
E401 - POWER AND SPECIAL SYSTEM PLANS  
E501 - ELECTRICAL SCHEDULES, DETAILS, & RISERS

## 01027 APPLICATIONS FOR PAYMENT

### General

- A. Work Included:** Comply with requirements of the Contract Documents to provide Applications for Payment. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.
- B. Related Work:**
1. Comply with the relative requirements of other Divisions, Sections, the General and Supplementary Conditions and the Drawings of the entire Contract Documents. The breakdown of this Project Manual into Divisions and Sections shall not define any limit of work.
- C. Schedule of Values:**
1. Coordination: Coordinate preparation of the Schedule of Values with preparation of the Contractor's construction schedule.
    - a. Correlate line items of the Schedule of Values with other required administrative schedules and forms, including:
      - (1) Application for Payment Form.
      - (2) List of Subcontractors.
      - (3) List of products.
      - (4) List of suppliers and fabricators.
      - (5) Schedule of submittals.
    - b. Submit the Schedule of Values to the Architect at the earliest feasible date, but in no case later than ten (10) days before the date scheduled for submittal of the initial Application for Payment.
  2. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values. A separate line item and value shall be established for each item of work or material.
  3. Identification: Include the following project identification on the Schedule of Values:
    - a. Project name and location.
    - b. Name of the Owner and Architect.
    - c. Project number.
    - d. Contractor's name and address.
    - e. Date of submittal.
  4. Arrangement: Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:
    - a. Specification Section name.
    - b. Change Orders (#) that have affected value.
    - c. Dollar value.
    - d. Percentage of Contract Sum to the nearest whole percent, adjusted to total 100 percent.
  5. Breakdown: Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into several items.
  6. Material Not Installed: For each part of the Work where an application may include materials not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the work.
  7. Overhead and Profit: Each item in the Schedule of Values and Applications for Payment shall be complete, including its total cost and proportionate share of general overhead and profit margin.
    - a. At the Contractor's option, temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown as separate line items in the Schedule of Values or distribution as general overhead expense.
  8. Schedule Updating: Update and resubmit the Schedule of Values when Change Orders result in a change in the Contract Sum.
- D. Applications for Payment:**
1. General: Each Application for Payment shall be consistent with previous applications for

- payments as certified by the Architect and paid for by the Owner.
- a. The initial Application for Payment, the Application for Payment at time of Substantial Completion and the final Application for Payment involve additional requirements.
  2. Payment Application: Monthly, the Contractor shall submit to the Architect an itemized Application and Certificate for Payment, supported by such data substantiating the Contractor's right to payment as the Owner or the Architect may require, and reflecting retainage as provided elsewhere in the Contract Documents. The form requirements for substantiating data are as follows:
    - a. Payments for materials or equipment stored off the site shall be conditioned upon submission by the Contractor of bills of sale or other such procedures satisfactory to the Owner to establish the Owner's title to such materials or equipment or otherwise protect the Owner's interest, including applicable insurance and transportation to the site of those materials or equipment.
    - b. Attach to the Payment Application a list of current stored material as of each month in which a change in stored material value is made in each category for each subcontractor and material supplier. List should designate location and insurance policy covering materials. Certificate of Insurance should be provided in an amount equal to or greater than the amount of stored material and designate that insurance is for stored item. If material is covered by Contractor's Builders Risk, this should be indicated.
    - c. Value of stored items shall remain in Column F, Materials Presently Stored (NOT in D or E) until stored material is installed in its final place in the project (incorporated into the work).
  3. Payment Application Forms: Use current AIA Document G702 and Continuation Sheet G703 as the form for Application for Payment.
  4. Application Preparation: Complete every entry on the form, including notarization and execution by same person that signed the Contract Agreement. Incomplete applications will be returned without action.
    - a. Entries shall match data on the Schedule of Values.
    - b. Include amounts of Change Orders issued prior to the last day of the construction period covered by the application.
  5. Transmittal: Submit four (4) executed copies of each Application for Payment to the Architect by means ensuring receipt within 24 hours.
    - a. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application in a manner acceptable to the Architect.
  6. Initial Application for Payment: Administrative actions and submittals that must precede submittal of the first Application for Payment, include the following:
    - a. List of Subcontractors with Subcontractor's firm name, address and telephone number.
    - b. List of principal suppliers and fabricators, with firm's name, address and telephone number.
    - c. Schedule of Values.
    - d. Schedule of principal products with supplier's or Subcontractor names, address, telephone number.
    - e. Submittal Schedule (preliminary if not final).
    - f. List of Contractor's staff assignments.
    - g. Copies of Building Permits (if applicable).
  7. Applications for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment. Administrative actions and submittals that shall precede this application include:
    - a. Occupancy permits from the State Fire Marshal, State Board of Health and similar approvals.
    - b. Warranties (guarantees) and maintenance agreements.
    - c. Test/adjust/balance records.
    - d. Maintenance instructions.
    - e. Meter readings.
    - f. Start-up performance reports.
    - g. Change-over information related to Owner's occupancy, use, operation and maintenance.
    - h. Final cleaning.
    - i. Advice on shifting insurance coverages.
    - j. List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion.
  8. Final Application for Payment: Administrative actions on submittals which must precede submittal

of the final payment Application for Payment include the following:

- a. Completion of Project Closeout requirements.
- b. Completion of items specified for completion after Substantial Completion.
- c. Transmittal of required Project construction records to Architect.
- d. Proof that taxes, fees and similar obligations have been paid.
- e. Removal of temporary facilities and services.
- f. Change of door locks to Owner's access.
- g. Executed AIA Document G707, Consent of Surety to Make Final Payment.

## 01040 COORDINATION

### **General**

- A. Work Included:** Comply with requirements of the Contract Documents and all applicable codes and regulations to provide coordination of the Work, the work of the various subcontractors and trades, and supervision of cutting and patching, as needed for a complete and proper installation.
- B. Related Work:** Comply with the relative requirements of other Divisions, Sections, the General and Supplementary Conditions and the Drawings of the entire Contract Documents. The breakdown of this Project Manual into Divisions and Sections shall not define any limit of work.
- C. Project Coordination:**
1. General: Coordinate the work of the various Sections of the specifications and various requirements of each Section, to assure efficient, orderly, and timely installation of construction elements.
  2. Related Parts: Verify that interrelated parts of the various systems and work of the trades are compatible.
  3. Space Requirements: Coordinate space requirements for installation of all the parts.
- D. Quality Assurance:** Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for the proper performance of the work of this Section.
- E. Submittals:**
1. Prior to cutting which effects structural safety, submit written request to the Architect for permission to proceed with cutting.
  2. Should conditions of the Work, or schedule, indicate a required change of materials or methods for patching, so notify the Architect and secure his written permission prior to proceeding.
- F. Cutting and Patching:**
1. General: Cutting and patching of all existing and/or newly constructed work and all new and existing site improvements, including attendant excavation and backfill, required to complete the Work, shall be done under the supervision of the Contractor. He shall be responsible to:
    - a. Make the several parts of the Work fit together properly.
    - b. Uncover portions of the Work to provide for installation of ill-timed work.
    - c. Remove and replace defective work or work not conforming to the requirements of the Contract Documents.
    - d. Remove samples of installed work as specified for testing.
    - e. Provide routine penetrations of the Work for the trades, except as modified in 01040 F 2 below.
  2. Subcontractors: Specialty subcontractors shall cut the Work, under the supervision of the Contractor, as required for the installation of their specialty and/or for routine penetrations of non-structural elements, for the installation of sleeves, piping, conduit, equipment, etc. The Contractor shall be responsible for patching of this work, unless the work is a product of that specialty subcontractor and unless otherwise specified under other Sections of these

specifications.

3. Submittals: Submit a written request to the Architect well in advance of executing any cutting or alteration which affects:
  - a. The structural value or integrity of an element of the project.
  - b. Metal roofing.
  - c. The integrity of weather-exposed or moisture-resistant systems.
  - d. The visual qualities of sight-exposed elements.
4. Request: Designate date and time the work will be uncovered.
5. Substitutions: Should conditions of the work or the schedule indicate a change of products from the original installation, submit a request for substitution.

**G. Inspection:**

1. Existing Conditions: Inspect existing conditions of the project, including elements subject to damage or to movement during cutting, patching, and backfilling.
2. Uncovered Work: After uncovering work, inspect conditions affecting installation of products or performance of work.
3. Questionable Conditions: Report questionable conditions to the Architect; do not proceed with work until the Architect has provided further instructions.
4. Approximate Dimensions: All dimensions indicated by  $\pm$  are approximate measurements and shall be field verified for accuracy.

**H. Preparation:**

1. Temporary Facilities: Provide adequate temporary support as necessary to assure the structural value and/or integrity of the affected portion of the Work.
2. Methods: Provide adequate devices and methods to protect other portions of the Work from damage.
3. Protection: Provide protection from the elements for that portion of the Work which may be exposed by cutting and patching work, and maintain excavations free from water.

**I. Application:**

1. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surfaces to receive installation of repairs.
2. Execute excavating and backfilling by methods which will prevent damage or damage to other work.
3. Employ the original installer/fabricator to perform cutting and patching for weather-exposed or moisture-resistant elements and sight-exposed finished surfaces.
4. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.
5. Restore work which has been cut or removed; install new products to provide completed work in accordance with the requirements of the Contract Documents.
6. Fit work which has been cut or removed; install new products to provide completed work in accordance with the requirements of Contract Documents.
7. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
8. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes.
9. Demolition for Remodeling:
  - a. General: Where existing items are removed, these areas shall be cleaned and prepared for painting. Adjacent areas cut out for doors or equipment; patching is required. Where new openings are cut in existing roofs and new roofs are not provided, these areas shall be patched and properly flashed. Contractor shall be responsible for all patching, including replacement of any rotted wood or damage to existing structures, grounds, etc., which are the result, either directly or indirectly, of the demolition or construction process.
  - b. Painting in Existing Areas: Painting, where required by the Drawings, shall be performed in existing areas. Surfaces already painted and are scheduled to be painted, shall be properly cleaned, patched, prepared, and primed as scheduled. Patched areas shall be considered as new work except that these areas shall match surrounding existing colors, paint types, gloss, etc.

- c. **Other Specialty Demolition Work:** The Contractor shall be responsible for removal of all demolished items when they are to be replaced as described on the Drawings. This work includes proper reconditioning of surfaces to insure the proper installation of new materials.

## 01050 FIELD ENGINEERING

### **General**

- A. Work Included:** Comply with requirements of the Contract Documents and all applicable codes and regulations to provide field engineering services as needed for a complete and proper installation of the various parts and project safety. The extent of work of this Section includes, but is not necessarily limited to:
  1. Establishing and maintaining lines and levels.
  2. Structural design of shores, forms and structural safety during construction.
  3. Similar items as part of the means and methods of construction.
- B. Related Work:**
  1. Comply with the relative requirements of other Divisions, Sections, the General and Supplementary Conditions and the Drawings of the entire Contract Documents. The breakdown of this Project Manual into Divisions and Sections shall not define any limit of work.
  2. Additional requirements for field engineering also may be described in other Sections of these Specifications.
- C. Quality Assurance:** Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for the proper performance of the work of this Section.
- D. Submittals:**
  1. Comply with pertinent provisions of Section 01300.
  2. Upon request of the Architect or if required in specific Sections, submit:
    - a. Data demonstrating qualifications of persons proposed for field engineering services.
    - b. Documentation certifying accuracy of field engineering work.
- E. Procedures:**
  1. In addition to procedures required for proper performance of good construction practices and project safety:
    - a. Locate and protect control points before starting work on the site.
    - b. Preserve permanent reference points during the progress of the Work.
  2. Do not change or relocate reference points or items of the Work without specific approval from the Architect.
  3. Promptly advise the Architect when a reference point is lost or destroyed or requires relocation because of other changes in the Work.
  4. Upon direction of the Architect, replace reference stakes or markers; locate such replacements according to the original survey control.

## 01090 DEFINITIONS AND STANDARDS

### **General**

- A. Work Included:** Comply with requirements of the Contract Documents and all applicable codes and regulations to provide administrative requirements for compliance with governing regulations, codes

and standards as needed for a complete and proper installation of the various parts and project safety.

**B. Related Work:**

1. Comply with the relative requirements of other Divisions, Sections, the General and Supplementary Conditions and the Drawings of the entire Contract Documents. The breakdown of this Project Manual into Divisions and Sections shall not define any limit of work.

**C. Definitions:**

1. General: Definitions contained in this Article are not necessarily complete, but are general to the extent that they are not defined more explicitly elsewhere in the Contract Documents.
2. Indicated: Refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in Specifications, and similar requirements in Contract Documents. Where terms such as “shown”, “noted”, “scheduled”, and “specified” are used, it is to help locate the reference; no limitation on location is intended except as specifically noted.
3. Directed: Terms such as “directed”, “requested”, “authorized”, “selected”, “approved”, “required”, and “permitted” mean “directed by the Architect”, “requested by the Architect”, and similar phrases. However, no implied meaning shall be interpreted to extend the Architect’s responsibility in the Contractor’s area of construction supervision.
4. Approve: The term “approved”, where used in conjunction with the Architect’s action on the Contractor’s submittals, applications, and requests, is limited to the duties and responsibilities of the Architect as stated in the General and Supplementary Conditions. Such approval shall not release the Contractor from the responsibility to fulfill Contract requirements unless otherwise provided in the Contract Documents.
5. Regulations: The term “Regulations” includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work, whether lawfully imposed by authorities having jurisdiction or not.
6. Shall: The term “shall” indicate mandatory requirement.
7. Furnish: The term “furnish” is used to mean “supply and deliver to the project site including unloading, unpacking and assembly” ready for installation and similar operations.
8. Install: The term “install” is used to describe operations at the project site including the actual “erection, placing, anchoring, applying, working to dimension, finishing, curing, connecting to mechanical and/or electrical services, protecting, cleaning and similar operations”.
9. Provide: The term “provide” means “to furnish and install, complete and ready for the intended use”.
10. Installer: The term “installer” is the Contractor, or an entity engaged by the Contractor, either as an employee, subcontractor, or sub-subcontractor for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
  - a. The term “experienced”, when used with the term “installer” means having a minimum of 5 previous projects similar in size and scope to this project, being familiar with the precautions required, and having complied with requirements of the authority having jurisdiction.
11. Project Site: The “project site” is the space available to the Contractor for performance of the Work. In general, if a “project limit line” is shown on the Drawings, then the “project site” is the area within this line. If a project limit line is not shown, then the project site is the actual building area site, including earthwork and paving areas, plus a 200’ wide perimeter around same. In no case, shall this defined area be construed to extend beyond the property line of the project site.
12. Testing Laboratory: A “testing laboratory” is an independent entity engaged to perform specific inspections or tests, either at the project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

**D. Industry Standards:**

1. Applicability of Standards: Except where Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents. Such standards are made a part of the Contract Documents by reference. Individual Sections indicate which codes and standards the



Contractor must keep available at the project site for reference.

- a. Referenced standards take precedence over standards that are not referenced but recognized in the construction industry as applicable.
2. Publication Dates: Where compliance with an industry standard is required, comply with standard in effect as of the date of Contract Documents.
3. Copies of Standards: Each entity engaged in construction on the project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.
  - a. Where copies of standards are needed for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source.

**E. Governing Regulations/Authorities:**

1. The Architect has contacted authorities having jurisdiction where necessary to obtain information necessary for the preparation of Contract Documents; that information may or may not be of significance to the Contractor. Contact authorities having jurisdiction directly for information and decisions having a bearing on the Work.
  - a. Copies of Correspondence: During preparation of the Contract Documents, the Architect has maintained a file of correspondence with the authorities having jurisdiction. This file is available at the Architect's office for reference. If requested, the Architect will provide copies of correspondence.

**F. Submittals:**

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

## 01200 PROJECT MEETINGS

**General**

- A. **Work Included:** Comply with requirements of the Contract Documents to attend project meetings as established herein, and as needed for a complete and proper installation. Project meetings shall include, but not necessarily limited to:
  1. Pre-Construction Conference.
  2. Progress Meetings.
  3. Called Meetings.
- B. **Related Work:** Comply with the relative requirements of other Divisions, Sections, the General and Supplementary Conditions and the Drawings of the entire Contract Documents. The breakdown of this Project Manual into Divisions and Sections shall not define any limit of work.
- C. **Arrangements:** The Architect shall make arrangements with the Owner and the Contractor. The Contractor shall notify the Architect, in writing, of his readiness.
  1. Participants: As stated under each conference or meeting description.
  2. Location: Project site.
  3. Record: The Contractor shall preside at meetings, record minutes, and mail a copy of decisions to the participants without delay.
- D. **Preconstruction Conference:** The Contractor shall schedule a preconstruction conference and organizational meeting at the project site no later than 15 days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments. The Contractor shall be responsible to see that his project superintendent and principal subcontractors are in attendance. The following items shall be discussed:

1. Tentative construction schedule.
  2. Critical work sequencing.
  3. Designation of responsible personnel.
  4. Procedures for processing Applications for Payment.
  5. Procedures for processing field decisions and Change Orders.
  6. Distribution of Contract Documents.
  7. Submittal of Shop Drawings, Product Data and Samples.
  8. Preparation of record documents.
  9. Use of premises.
  10. Office, Work and storage areas.
  11. Equipment deliveries and priorities.
  12. Security.
  13. Housekeeping.
  14. Schedule of demolition.
- E. Progress Meetings:** Conduct progress meetings at the project site at regularly scheduled intervals. A regular meeting time will be mutually established by the Architect, Owner and Contractor.
- F. Called Meetings:** When required by project conditions, called meetings shall be held.
- G. Reporting:** No later than three days after each meeting, distribute copies of the minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

## 01300 SUBMITTALS

### *General*

- A. Work Included:** Comply with requirements of the Contract Documents to provide submittals, as specified in applicable Sections, as specified herein and as needed for a complete and proper installation.
- B. Related Work:** Comply with the relative requirements of other Divisions, Sections, the General and Supplementary Conditions and the Drawings of the entire Contract Documents. The breakdown of this Project Manual into Divisions and Sections shall not define any limit of work.
- C. Submittals:** Transmit to Braddock Companies, LLC, 4024 Jackson St, Alexandria La. 71303, under AIA Form G810. Identify the project, the Contractor, the subcontractors, the fabricator or supplier, and the item(s) submitted.
- D. Progress Schedule:**
1. General: Submit, at the preconstruction conference, four (4) copies of a proposed Progress Schedule, identifying the first day of each month.
  2. Product: Show the complete sequence of construction, identifying the work of separate stages and other logically grouped activities. Show submittal dates required for Shop Drawings, Product Data, and Samples, and product delivery dates.
- E. Schedule of Values:** Submit, at the Pre-Construction Conference, four (4) copies of a Schedule of Values.

### *Products*

- F. Shop Drawings:**
1. General: Submit Shop Drawings, Product Data, and Samples as required by the General

Conditions, of the Contract for Construction (AIA Document A201), and applicable specification Sections.

2. **Product:** Prepare or order the number of copies of each, that will be required to distribute to the Contractor's file, the job site file, the record documents file, subcontractors, supplier or fabricator, plus two (2) copies for the Architect.
3. **Copies:** Submit, to the Architect, no less than four (4) copies of each. The Architect shall review, stamp and initial, retain two copies, and return the other copies to the Contractor.
4. **Execution:** The Contractor shall identically mark his remaining copies and distribute.
5. **Resubmittal:** In the event that resubmission is required, the Contractor shall correct submittals, as noted by the Architect, prepare or order original number of copies, and resubmit and distribute as originally required.

**G. Product Data:** Order and submit as required, in the same manner and number, as for Shop Drawings. Legibly mark each copy to identify the exact product, model, description, options, etc. Include manufacturer's installation instructions as required by the applicable specification Section.

**H. Samples:**

1. **General:** Submit samples as required by the General Conditions of the Contract for Construction (AIA Document A201), and applicable specifications.
2. **Copies:** Submit one (1) sample or set of samples, currently available from the manufacturer or fabricator, from which the Architect will be able to make a selection for color, pattern, texture, or workmanship.
3. **Execution:** The Architect shall, after receiving all samples, make his selection and return, in writing, approval and/or color schedule.
4. **Field Samples:** Construct field samples as required by applicable specification Sections. Construct with project materials and workmanship to exemplify the finished product. The Architect's approval shall be obtained before construction begins.

## 01400 QUALITY CONTROL

**General**

**A. Work Included:** Comply with requirements of the Contract Documents and all applicable codes and regulations to provide quality control over products, fabricators, suppliers, services, site conditions and workmanship, as specified herein and as needed for a complete and proper installation.

**B. Related Work:** Comply with the relative requirements of other Divisions, Sections, the General and Supplementary Conditions and the Drawings of the entire Contract Documents. The breakdown of this Project Manual into Divisions and Sections shall not define any limit of work.

**C. References:**

1. **General:** Comply with the recommendations and requirements of the referenced standards of applicable specification Sections.
2. **Inspection:** Where references recommend inspection of facilities or plant, the Contractor shall consult with the Architect for instructions as to procedure.

**D. Testing Laboratory Services:**

1. **Selection and Payment:** The Contractor shall engage and pay for the services of an independent testing laboratory to perform inspection and tests of materials and construction as required by applicable specification Sections, and in the event of a test failure, the Contractor shall pay for re-testing.
2. **Cooperation:** Cooperate with the laboratory and:
  - a. Make available, without cost, samples of all materials to be tested in accordance with applicable standard specifications.
  - b. Furnish such nominal labor and sheltered working space as is necessary to obtain samples at

- the project.
- c. Advise the laboratory of the identity of materials sources and instruct the suppliers to allow test or inspections by the laboratory.
  - d. Notify the laboratory sufficiently in advance of operations to allow for completion of initial tests and assignment of inspection personnel.
  - e. Notify the laboratory sufficiently in advance of cancellation of required testing operations. The Contractor shall be responsible to the laboratory for charges due to failure to notify if requirements for testing are canceled.
3. Test Methods: Tests and inspections shall be conducted in accordance with the latest standards of ASTM or other recognized authorities.
  4. Test Reports: The laboratory shall promptly submit written reports of each test and inspection made to the Owner, the Architect, the Contractor and to such other parties the Owner may specify.
  5. Extent of Laboratory Tests and Inspections: The type and number of tests to be performed on the project shall be specified in each Section of the specifications requiring the tests. The Contractor is responsible for supplying concrete that meets the concrete design mixes specified under Division 3 of the Contract Documents.
- E. Inspection Services:**
1. Field Inspection: When specified in applicable Sections, the Contractor shall require a manufacturer's representative to provide qualified personnel to inspect field conditions and make appropriate recommendations and/or demonstrate recommended methods of installation or application.
  2. Written Report: The manufacturer's representative shall submit his written report to the Contractor, with a copy to Architect, listing observations and recommendations.

## 01500 TEMPORARY FACILITIES AND CONTROLS

### **General**

- A. Work Included:** Comply with requirements of the Contract Documents and all applicable codes and regulations to provide temporary facilities and controls, as specified herein and as needed for a complete and proper installation.
- B. Related Work:** Comply with the relative requirements of other Divisions, Sections, the General and Supplementary Conditions and the Drawings of the entire Contract Documents. The breakdown of this Project Manual into Divisions and Sections shall not define any limit of work.
- C. Temporary Utilities:**
1. Temporary Electricity and Lighting: Provide temporary electrical power and lighting necessary to maintain working conditions required to perform specified tasks satisfactorily. Provide services for all trades. The Contractor's electrical subcontractor shall arrange for temporary power. Any building of temporary services necessary shall be done at the expense of the Contractor; the Contractor shall pay for energy. At the completion of the project, he shall disconnect and leave original electrical work in a safe condition.
  2. Temporary Heating, Cooling and Ventilating: Provide temporary heat and ventilation as required to maintain adequate environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for the installation of materials, and to protect materials and finishes from damage. The Contractor's use of the permanent equipment is hereby qualified as follows:
    - a. Do not use permanent equipment until all filters and safety devices, specified or required for safe operation, are installed and operating properly.
    - b. The Contractor shall assume all responsibility for its use.
    - c. The Contractor shall be responsible for initiating, maintaining, and supervising all safety

- precautions and programs in connection with the work.
- d. The warranty period on the equipment shall not commence until the date of filing of the Substantial Completion Certificate.
  - e. If the Contractor uses permanent equipment, he shall, at Substantial Completion, leave the units with clean filters and in good operating order.
3. **Temporary Telephone:** Provide direct line telephone service, in the field office, for use of personnel and employees. Pay all costs for installation, maintenance, removal, and service charges.
  4. **Temporary Water:** Arrange with the Municipal Water System to provide water. The Contractor shall pay for the cost of water.
  5. **Temporary Sanitary Facilities:** Provide and maintain an adequate number of toilet accommodations, of the portable chemical type, for the use of the workmen; keep same in clean and sanitary condition. Remove on completion of the Work and leave premises clean. The Contractor shall be held responsible for the proper use and care of the facilities.
  6. **Temporary Fire Protection:** During construction, provide and maintain one (1) fire extinguisher for every 2,500 square feet of building being worked on, or part thereof, and in field office building.
- D. Construction Aids:** Provide all engineering and materials required for all staging platforms, scaffolding, guard rails, ladders, temporary runways, temporary flooring, railing and ladders, as required for construction and project safety.
- E. Barriers and Enclosures:** Provide barricades and/or fences, as required for safety, non-admission, or required, to keep visitors away from the work area during and after work hours. Remove, clean, and finish grade at completion of project.
- F. Security:** Barricade or fence or provide security service, as required, to protect work and property against vandalism and for life safety; the Contractor is solely responsible as the Owner shall not provide security.
- G. Access Roads and Parking Areas:** Provide and maintain access ways to storage areas and to work areas only from locations approved by the Architect. Grade and finish to original condition at completion of the project.
- H. Temporary Controls:**
1. **Construction Cleaning:** Execute cleaning, during progress of the Work, for project safety and protection of surfaces. For cleaning for specific products of work, see the specifications Section for that work. Use only those cleaning materials and methods which will not create hazards to health or property and only methods recommended by the manufacturer of the surface material to be cleaned. Use cleaning materials only on surfaces recommended by cleaning material manufacturer. Remove debris periodically.
  2. **Erosion and Sediment Control:** Maintain, new and existing, grading and surface water drainage structures against erosion and sediment during the life of the project adjacent to the project area. Leave existing site grades in original position and elevation and new grades to contour, as noted on drawings, at completion of the project. The Contractor shall not be held responsible for maintenance of the entire site, except as may be disturbed by him.
  3. **Surface Water Control:** Guard against, through the life of project, changing the flow of water so as to cause flooding. The Contractor is responsible for any damage, caused by such water, to new buildings and to site. Erect such structures as needed to control such conditions.
- I. Field Offices and Sheds:**
1. **Temporary Field Office:** As required by mutual consent, provide and maintain a temporary field office at the project site for your own use and the use of representatives of the Owner and the Architect. Provide the office with adequate heat, cooling, lighting, telephone, file racks for storage of drawings, and a work counter top. Locate office as approved by Owner. Remove and clean at completion of project.
  2. **Temporary Sheds:** Provide and maintain additional offices, storage sheds, and other temporary buildings or trailers as required for construction. Location of sheds and trailers shall be approved

by Architect. Remove and clean when work is completed, or as directed.

**J. Project Identification and Signs:**

1. Identification Signs: Not required.
2. Project Sign: Not required.

## **01600 MATERIAL AND EQUIPMENT**

### ***General***

- A. Work Included:** Comply with requirements of the Contract Documents and all applicable codes and regulations to provide materials and equipment, in the types and arrangements shown on the Drawings, as specified herein and as needed for a complete and proper installation.
- B. Related Work:** Comply with the relative requirements of other Divisions, Sections, the General and Supplementary Conditions and the Drawings of the entire Contract Documents. The breakdown of this Project Manual into Divisions and Sections shall not define any limit of work.
- C. Compliance:** Conform to applicable specification requirements and referenced standards. Comply with size, make, type, and quality specified, or as specifically approved in writing by the Architect.
- D. Manufactured and Fabricated Products:** Design, fabricate, and assemble in accordance with the best engineering and shop practices. Equipment capacities, sizes, and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.
- E. Definition:** Where the word "provide" is used, it shall mean furnish and install.
- F. Manufacturer's Instructions:**
1. Submittal Requirements: When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions in accordance with Section 01300 G Product Data.
  2. Installation: Perform work in accordance with the manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by the Contract Documents. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Architect. Do not proceed with work without clear instructions.
- G. Transportation and Handling:**
1. Deliveries: Arrange deliveries of products in accordance with construction schedules; coordinate to avoid conflict with work and conditions at the site. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible. Immediately on delivery, inspect shipments to assure compliance with requirements of the Contract Documents and reviewed submittals, and that products are properly protected and undamaged.
  2. Handling: Handle all products in accordance with manufacturer's instructions. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.
- H. Storage and Protection:**
1. General: Store products in accordance with manufacturer's instructions, with seals and labels intact and legible.
  2. Interior Storage: Store products subject to damage by the elements in weathertight enclosures. Maintain temperature and humidity within the ranges required by manufacturer's instructions.
  3. Exterior Storage: Store fabricated products above the ground, on blocking or skids. Cover products which are subject to deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation. Store loose granular materials in a well drained area on solid

surfaces to prevent mixing with foreign matter; cover.

4. Access: Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, free from damage or deterioration.
5. Protection After Installation: Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove when no longer needed.

**I. Product Specification:**

1. General: Wherever in the specifications, the name of a certain brand, make, manufacturer or definite specification is utilized, it is used only to denote the quality standard of the product desired; it is not the purpose of these specifications to discriminate against any "equal" product of another manufacturer. It is the intent to set a definite product standard and through publishing, in an addendum, a list of "Acceptable" products or manufacturers, the Owner shall receive the full benefit of any savings in cost involved.
2. Other Acceptable Manufacturers: Wherever in the Specifications "Other Acceptable Manufacturers" are specified, "Equal" products of these manufacturers are acceptable for bidding purposes in addition to those specified. Acceptance of products or manufacturers other than those specified is based upon the best information available at the time. Should any modification be required to accommodate a substitute product, it is the responsibility of this supplier and/or subcontractor to include the cost of this modification in his quotation. It should be understood that any deviation from the product(s) specified with respect to quality, details and performance in the opinion of the Architect is grounds for rejection of this product subsequent to a contract award.
3. Prior Approval: If a potential supplier wishes to submit for prior approval a particular product other than a product specified in the Contract Documents, he shall do so no later than ten (10) calendar days prior to the opening of bids. Seven (7) calendar days prior to bid time, exclusive of holidays, the Architect shall furnish to both the Owner and the potential supplier written approval or denial of the product submitted. All such approvals shall be included in an addendum issued prior to bidding so that all bidders are aware of the products approved. A request for "Prior Approval" constitutes certain representations, made in Paragraph 01600 J 4 below.

**J. Product Options and Substitutions:**

1. Products List: Submit to the Architect at the preconstruction conference, a complete list of major products proposed to be used, with the name of the manufacturer and the installing subcontractor.
2. Contractor's Product Options:
  - a. For products specified only by reference standard, select any product meeting that standard.
  - b. For products specified only by detailed specifications of its parts or functions, select any product that meets or exceeds that specification. In this instance, the specification of the product(s) named shall establish the minimum requirements for that product that is acceptable.
  - c. For products specified by naming several products or manufacturers, select any one of the products or manufacturers named, which complies with the specifications.
  - d. For products specified by naming one or more products or manufacturers and "or equal", either select that product or select a product by another manufacturer which equals or exceeds the specifications of the product specified. In this instance, the specification of the product(s) named shall establish the minimum requirements for that product that is acceptable.
  - e. For products specified by naming one or more products or manufacturers and "or approved equal", submit a request prior to Bid Date, as for substitutions, for any product or manufacturer not specifically named.
3. Substitutions: Except as stated above, substitutions are only allowed by approval prior to bid date as stipulated in the Instructions to Bidders. If a product that is specified becomes unavailable due to no fault of the Contractor, an item that has been approved prior to bid date may be substituted. If prior approved items become unavailable or if no prior approval exists for the unavailable item, the Architect will consider written requests from the Contractor for substitution of products. Submit a separate request for each product, supported with complete data, with drawings and samples as appropriate.

4. **Contractor's Representation:** A request for a substitution constitutes a representation that the Contractor:
  - a. Has investigated the proposed product and determined that it is equal to or superior in all respects to that specified.
  - b. Will provide the same warranties or bonds for the substitution as for the product specified.
  - c. Will coordinate the installation of an accepted substitution into the Work, and make such other changes as may be required to make the Work complete in all respects.
  - d. Waives all claims for additional costs, under his responsibility, which may subsequently become apparent.
5. **Architect Review:** The Architect will review requests for substitutions with reasonable promptness, and notify the Contractor, in writing, of the decision to accept or reject the requested substitution. The Architect shall be the judge of the acceptability of the proposed substitution.

## 01700 CONTRACT CLOSEOUT

### **General**

- A. **Work Included:** Comply with requirements of the Contract Documents and all applicable codes and regulations to provide administrative procedures in closing out the Work.
- B. **Related Work:** Comply with the relative requirements of other Divisions, Sections, the General and Supplementary Conditions and the Drawings of the entire Contract Documents. The breakdown of this Project Manual into Divisions and Sections shall not define any limit of work.
- C. **Final Cleaning:**
  1. **General:** Execute cleaning for the Substantial Completion Inspection.
  2. **Clean:** All building finishes, fixtures and equipment, including all mechanical equipment. Clean air conditioning systems permanent filters or replace disposable filters if units were operated during construction.
  3. **Clean and Polish:** All finish hardware, hard floors, and glossy surfaces.
  4. **Broom clean exterior paved surfaces; rake clean grounds.**
- D. **Record Documents:**
  1. **General:** Maintain at job site in field office, one copy of the Fire Marshall's review copy of the Contract Documents, an additional copy of the Contract Documents for noting preliminary "As Built" details, Addenda, reviewed Shop Drawings, Color Schedule and Color Samples, Change Orders, List of Subcontractors, List of Materials, and Field Test Records. Store documents in files separate from documents used for construction; do not use these documents for construction purposes. Label each document "Project Record".
  2. **Recording:** Legibly mark the Contract Documents to note actual construction details as follows:
    - a. Depths of foundation elements different than shown on Drawings.
    - b. Horizontal and vertical location of underground utilities referenced to permanent surface improvements.
    - c. Location of internal utilities concealed in construction.
    - d. Field changes of dimension and detail.
  3. **Shop Drawings:** Legibly mark to record changes made after review.
  4. **Submittal:** Submit to the Architect, with transmittal letter, at Contract closeout.
- E. **Operating, Maintenance Data and Keys:**
  1. **General:** Compile product data and related information appropriate for the Owner's maintenance and operation of products furnished under the Contract. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent sections of specifications. Instruct Owner's personnel in the maintenance of products and in the operation of equipment, systems, and key schedule.



2. Quality Assurance: Preparation by personnel trained and experienced in maintenance and operation of the described products and completely familiar with requirements of this Section.
3. Submittal: Submit, for Architect review, at Substantial Completion inspection. Submit keys and schedule to the Owner, with transmittal letter.
4. Form of Submittals and Operating and Maintenance Data: Prepare data in the form of an instructional manual for use by the Owner's personnel.
5. Content of Manual of Operating and Maintenance Data:
  - a. Table of Contents: Neatly typewritten for each volume, arranged in a systematic order with the name of the Contractor, responsible principal, address, and telephone number; an indexed list of each product required to be included, with the name, address, and telephone number of subcontractor or installer and identify the local source of supply for replacement parts. Identify each product-by-product name and other identifying symbols as set forth in Contract Documents.
  - b. Product Data: Annotate each sheet to clearly identify the specific Product.
  - c. Drawings: Supplement product data with drawings as necessary to clearly illustrate component parts. Do not use Project Record Drawings as maintenance drawings.
  - d. Written Text: As required to supplement product data for the particular installation.
  - e. Copies: Provide a copy of each warranty, bond, and service contract issued. Provide information sheet for Owner's personnel, giving proper procedures in the event of failure and instances which might affect the validity of warranties.

**F. Substantial Completion:**

1. General: Comply with the requirements of the General and Supplementary Conditions of the Contract Documents.
2. Approval: If the Architect concurs that the Work is substantially complete, he will prepare and submit, to the Owner and the Contractor, for their acceptance, a Certificate of Substantial Completion on a form similar to AIA Form G704, accompanied by the Contractor's list of items to be completed or corrected, as verified and amended by the Architect.
3. Execution: The Owner shall file the signed Substantial Completion Certificate with the Clerk of Court and notify the Contractor, in writing, of compliance.

**G. Final Inspection:** When the Contractor considers the Work complete, he shall submit to the Architect, written notice that the Contract Documents have been reviewed, he has made an inspection, and the Work is complete and ready for the Architects final inspection. If the Architect finds that the Work is acceptable under the Contract Documents, the Contractor shall make closeout submittals.

**H. Closeout Submittals:**

1. General: In addition to submittals required by the General Conditions of the Contract Documents and the Supplementary Conditions, the Contractor shall submit:
  - a. A notarized No Lien Certificate from the office of the Clerk of Court.
  - b. A final statement of accounting showing the total adjusted Contract sum, previous payments, and sum remaining due.
  - c. The Project Record documents.
  - d. Executed AIA Document G707, Consent of Surety to Make Final Payment.

**END GENERAL REQUIREMENTS**

## SECTION 02050 - DEMOLITION

### PART 1 – GENERAL

#### 1.01 WORK INCLUDED:

- A. Comply with requirements of the Contract Documents and all applicable codes and regulations to provide demolition, as shown on the Drawings, as specified herein and as needed for a complete and proper installation.

#### 1.02 RELATED WORK:

- A. Comply with the relative requirements of other Divisions, Sections, the General and Supplementary Conditions and the Drawings of the entire Contract Documents.
- B. The breakdown of this project manual into Divisions and Sections shall not define any limit of work.

#### 1.03 QUALITY ASSURANCE:

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for the proper performance of the work of this Section.

#### 1.04 SALVAGE:

- A. The Owner shall have priority for the selection of salvaged equipment and materials. Any equipment and material selected to remain the property of the Owner shall be removed from the site by Owner.
- B. Material not retained by the Owner shall become the property of the Contractor and shall be removed from the site by him.

#### 1.05 SUBMITTALS:

- A. Schedule of Building Demolition:
  - 1. Submit, in writing at Preconstruction Conference, proposed methods and operations of demolition to Architect for review.
  - 2. Include in schedule, coordination for shut-off and capping and continuation of utility services as required.
- B. Permit:
  - 1. If required by local authorities, obtain permit for transport and/or disposal of debris.

#### 1.06 SITE CONDITIONS:

- A. Condition of Structures:
  - 1. The Owner assumes no responsibility for the actual condition of structures to be demolished.
  - 2. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner in so far as practicable.

3. However, variations within the structure may occur prior to the start of the demolition work.
- B. Uncovering of Asbestos:
  1. If, in the course of demolition, any form of asbestos, previously undiscovered, is uncovered, the work shall be immediately halted, and the Architect and Owner shall be so informed, first by telephone and then in writing.
  2. Work shall not continue until the asbestos is removed by a Specialty Contractor, under a separate contract, who is experienced in the removal of this type of material.
- C. Asbestos Removal:
  1. Separate Contract:
    - a. Any asbestos encountered will be removed by the Owner through a separate contract.
  2. This Contract:
    - a. Coordinate the Work to allow the work of the separate contract to be accomplished before any work of this Contract is done in these areas.
    - b. The replacement of the item(s) removed is scheduled in the Drawings.

## **PART 2 – PRODUCTS**

### **2.01 DEMOLISHED MATERIALS:**

- A. Remove accumulations daily or as approved by Architect.

## **PART 3 – EXECUTION**

### **3.01 GENERAL DEMOLITION:**

- A. Traffic:
  1. Conduct demolition operations and removal of debris to ensure minimum interference with adjacent facilities.
- B. Protection:
  1. Ensure safe passage of persons around area of demolition.
  2. Conduct operations to prevent injury to adjacent buildings, trees and vegetation, and persons.
  3. Contractor shall protect work area with proper barricades to prevent access by
- C. Pollution Control:
  1. Use water sprinklering, temporary enclosures, and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level.
- D. Damages:
  1. Promptly repair any damage to adjacent facilities by demolition operations at no cost to Owner.
- E. Utility Services:
  1. Maintain existing utilities indicated to remain; keep in service, and protect against damage during demolition operations.
  2. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by Owner.
  3. Provide temporary services during interruptions to existing utilities, as acceptable to Owner.

- F. Fill:
  - 1. Where excavation is required by demolition work, select fill material shall be provided to bring the finish grade back to surrounding finish grade elevations with good drainage.
  - 2. Fill shall be installed in 6" lifts and compacted to densities specified in Section 02200.
  - 3. Fill material is not available on site.
- G. Removal:
  - 1. General:
    - a. Remove all debris from site weekly.
  - 2. Disposal:
    - a. All demolished material to be legally disposed of offsite.
  - 3. Burning:
    - a. Not allowed on site.
  - 4. Completion:
    - a. Remove all demolished materials, tools, and equipment from site upon completion of work.
- H. Schedule of Demolition:
  - a. Refer to demolition scheduled in Drawings.

**END OF SECTION 02050**

## SECTION 03010 - CONCRETE BONDING AGENT

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. This Specification shall be read as a whole by all parties concerned. Each Section may contain more or less the complete Work of any trade. The Contractor is solely responsible to make clear to the Subcontractors the extent of their Work and coordinate overlapping Work.

#### 1.02 SYSTEM DESCRIPTION

- A. This specification describes the use of a one-component, cementitious, anti-corrosion coating for reinforcing steel in concrete restoration.

#### 1.03 RELATED SECTIONS

- A. 03930 Concrete Rehabilitation

#### 1.04 QUALITY ASSURANCE

- A. Manufacturing qualifications: The manufacturer of the specified product shall be ISO 9001 certified and have in existence a recognized ongoing quality assurance program independently audited on a regular basis.
- B. Contractor qualifications: Contractor shall be qualified in the field of grouting with a successful track record of 5 years or more. Contractor shall maintain qualified personnel who have received product training by a manufacturer's representative.
- C. Store and apply materials in accordance with all safety and weather conditions required by manufacturer or as modified by applicable rules and regulations of local, state and federal authorities having jurisdiction. Consult Material Safety Data Sheets for complete handling recommendations.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. All materials must be delivered in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers. Damaged material must be removed from the site immediately.
- B. Store all materials off the ground and protect from rain, freezing or excessive heat until ready for use.
- C. Condition the specified product as recommended by the manufacturer.

#### 1.06 JOB CONDITIONS

- A. Environmental Conditions: Do not apply material if it is raining or snowing or if such conditions appear to be imminent. Minimum application temperature 45oF (7oC) and rising.
- B. Protection: Precautions should be taken to avoid damage to any surface near the work zone due to mixing and handling of the specified material.

**1.07 SUBMITTALS**

- A. Submit two copies of manufacturer's literature, to include: Product Data Sheets (PDS), and appropriate Safety Data Sheets (SDS).
- B. Submit copy of Certificate of Approved Contractor status by manufacturer.

**1.08 Warranty**

- A. Provide a written warranty from the manufacturer against defects of materials for a period of one (1) year, beginning with date of substantial completion of the project.

**PART 2 - PRODUCTS****2.01 MANUFACTURER**

- A. Sika® Armatec® 1C, as manufactured by Sika® Corporation, or other approved equal.

**2.02 MATERIALS**

- A. The Portland cement adhesive shall be Sika® Armatec® 1C:
  1. Shall be a blend of selected Portland cements and sands.
  2. The material shall not contain asbestos.

**2.03 PERFORMANCE CRITERIA**

Typical Properties of the mixed polymer-modified, Portland cement mortar:

Yield	45 lin.ft/ #4 bar (13.7 m)
Color	Red/orange color
Mixing Ratio	1.2 qts. of water
Application Thickness	1/32"
Application Temp	45–95 °F (7–35 °C)
Contact Time	6-24 hours
Pot life	~ 60 minutes
Resistance to saline fog 120 hours (ASTM B-117)	Excellent

Note: Tests above were performed with the material and curing conditions @ 71°F – 75°F and 45 - 55% relative humidity.

The cement adhesive shall not produce a vapor barrier.

Material must be proven to prevent corrosion of reinforcing steel when tested under the procedures as set forth by the Federal Highway Administration Program Report No. FHWA/RD86/193. Proof shall be in the form of an independent testing laboratory corrosion report showing prevention of corrosion of the reinforcing steel.

**PART 3 – EXECUTION****3.01 MIXING AND APPLICATION**

- A. Mixing: Mix the entire bag with 1.2 quarts of water. Mix with a low speed drill (<300 rpm) and a jiffy paddle. Mix for 3 minutes until uniform with no lumps. Mix only that quantity that can be applied within its pot life.
- B. Placement procedure: Apply to prepared surface with a stiff-bristle brush, broom or “hopper type” spray equipment.
  - 1. Hand-applied mortars - Place fresh, plastic concrete/mortar while the bonding bridge adhesive is “wet” or within open times.
  - 2. Machine-applied mortars - Apply while the bonding bridge adhesive is “wet” or within the open times.
- C. Adhere to all procedures, limitations and cautions printed in the manufacturer’s current Product Data Sheet (PDS) and literature.

**3.02 CLEANING**

- A. The uncured Portland cement adhesive can be cleaned from tools with water. The cured Portland cement adhesive can only be removed mechanically.
- B. Leave finished work and work area in a neat, clean condition without evidence of spill overs onto adjacent areas.

**END OF SECTION 03010**

## **SECTION 03911 SURFACE APPLIED CORROSION INHIBITOR (SACI)**

### **PART 1 - GENERAL**

#### **1.01 RELATED DOCUMENTS**

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

#### **1.02 SUMMARY**

- A. Provide a SACI on concrete and other acceptable substrates in order to reduce the effects of corrosion.
  - 1. Work includes substrate preparation including crack and joint treatment.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
  - 1. Section 03300 – CAST-IN-PLACE CONCRETE.
  - 2. Section 07920 – ELASTOMERIC JOINT SEALANTS
  - 3. Section 09965 – ELASTOMERIC COATINGS.

#### **1.03 PERFORMANCE REQUIREMENTS**

- A. The SACI is intended to mitigate active corrosion, and/or delay the onset of corrosion.
  - 1. System shall perform as a corrosion inhibitor.
  - 2. Manufacturer shall provide all SACI materials that are physically and chemically compatible when installed in accordance with manufacturer's current application requirements.

#### **1.04 SUBMITTALS**

- A. Submittals: Comply with project requirements for submittals as specified in Division 01.
- B. Product Data:
  - 1. Materials list of items proposed to be provided under this Section.
  - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
- C. Site mockup: For confirmation of performance, construction sequencing and standard of acceptance. Complete prior to commencing with the project.
- D. Pre-Construction Field Adhesion Testing: Written results of field tests, including summary of joint preparation, surface preparation, products used and installation techniques.

#### **1.05 QUALITY ASSURANCE**

- A. Installer Qualifications:
  - 1. Installer shall have at least three years' experience in installing materials of types specified and shall have successfully completed at least three projects of similar scope and complexity.
  - 2. Installer shall designate a single individual as project foreman who shall be on site at all times during installation.



- B. Applicable Regulations: Comply with local code and requirements of authorities having jurisdiction. Do not exceed VOC regulations as established by the State in which they are being installed; including total VOC content, in grams per liter, for all system components (i.e. primers, adhesives, coatings, and similar items.)

#### 1.06 PRE-INSTALLATION CONFERENCE

- A. Prior to scheduled commencement of the SACI installation and associated work, conduct a meeting at the project site with the installer, architect/consultant, owner, manufacturer's representative and any other persons directly involved with the performance of the Work. The Installer shall record conference discussions and include decisions and agreements reached (or disagreements), and furnish copies of recorded discussions to each attending party. The main purpose of this meeting is to review foreseeable methods and procedures related to the Work.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. SACI materials must be delivered in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers. Damaged material must be removed from the site immediately.
- B. Store SACI materials off the ground and protect from rain, freezing or excessive heat until ready for use.
- C. Condition the specified product as recommended by the manufacturer.

#### 1.08 PROJECT CONDITIONS

- A. Environmental Conditions: Do not apply material if it is raining or snowing or if such conditions appear to be imminent. Minimum application temperature is 40 degrees F and rising.
- B. Protection: Precautions should be taken to avoid damage to any surfaces near the work zone due to mixing and handling of the specified material.

#### 1.09 WARRANTY

- A. Warranty: Provide manufacturer's standard warranty for each type of product. Warranty shall include manufacturer's statement that materials in contact with another have been tested and verified to be compatible. Include written testing documentation and test reports if requested by Architect.

### **PART 2 - PRODUCTS**

#### 2.01 MANUFACTURER

- A. Basis-of-Design Manufacturer: Sika Corporation, 201 Polito Avenue, Lyndhurst NJ 07071. Toll Free 800-933-SIKA (7452), [www.sikausa.com](http://www.sikausa.com). No substitutions without prior written approval by the Architect.
- B. Dual-Functional, SACI: Sika FerroGard 908 Dual-functional, SACI and penetrating sealer for reinforced concrete with the following properties:
  1. Sealer Type: Alkylalkoxy silane.
  2. Active ingredient content: 99%
  3. Color: Clear

4. VOC: 327 g/l
  5. Flashpoint: 104 degrees F
  6. Chloride penetration (NCHRP 244) applied @ 125 sf/gallon: Series II – Absorbed chloride 88%, Series IV – Absorbed chloride 99%
  7. Application temperature (ambient and substrate): 40°-95°F.
  8. Pot life: Indefinite.
  9. Corrosion reduction (ASTM G 109 modified) with 2.5 years of data, application applied before cracking and before corrosion vs a control: 92% corrosion reduction.
- C. Testing: Unless indicated otherwise, performance testing in this Section was performed at ambient temperature, with curing conditions of 73 degrees F and 50 percent relative humidity.
- D. Concrete Repair and Patching Materials: As recommended by manufacturer of SACI.
- E. Elastomeric Sealants: As recommended by manufacturer of SACI. For exterior joints in vertical surfaces such as, but not limited to control and/or expansion joints in cast-in-place concrete or unit masonry, joints between architectural pre-cast concrete units, joints between dissimilar materials or perimeter joints at frames of doors, windows, storefronts, louvers and similar openings apply a low-modulus, single-component or multi-component non-sag sealant in compliance with ASTM C920, Type M, Grade NS, Class 25. Acceptable products:
1. Sikaflex 2c, a 2-component, premium-grade, polyurethane-based chemical cure, elastomeric sealant.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that surfaces and conditions are ready to accept the Work of this section. Verify surfaces are clean, dry, sound and free of voids, deformations, protrusions and contaminants that may inhibit application or performance of the elastomeric coatings. Notify Architect in writing of any discrepancies. Commencement of the Work in an area shall mean Installer's acceptance of the substrate.

#### **3.02 PREPARATION**

- A. Verify that the surfaces are clean and open texture.
- B. Substrates must be clean, sound, dry, and absorbent free of surface contaminants or other contaminants deleterious to the penetration of the SACI. Remove dust, laitance, and grease, oils, curing compounds, form release agents existing coatings and all foreign particles by mechanical means. Substrate shall be in accordance with ICRI Guideline No. 03732 for sealers and fall within CSP1 to CSP3.

#### **3.03 APPLICATION OF CONCRETE REPAIR AND PATCHING MATERIALS**

- A. Fill all visible hairline cracks and surface defects with appropriate Sika repair mortar (where appropriate), leveling mortar or joint sealant prior to applying corrosion treatment. Bugholes or irregularities of substrate shall be leveled with specified leveling mortar or surface fillers where appropriate.

#### **3.04 CRACK TREATMENT FOR CONCRETE**

- A. For non-structural cracks, 12 mils or less apply the SACI in accordance with the Product Data Sheet.
- B. For non-structural cracks greater than 12 mils rout and seal the crack to a 1/4 inch by 1/4 inch profile and properly seal with a flexible, specified elastomeric joint sealant.
- C. For structural static cracks, inject with a suitable epoxy i.e. Sikadur 35 Hi-Mod LV with Sikadur 31 Gel (cap seal).

### 3.05 APPLICATION OF SACI

- A. The SACI is delivered ready to be used. No mixing is required and do not dilute on site.
- B. Coverage is entirely dependent on the porosity of the substrate. Normally the consumption is achieved with 2 coats. Extremely porous substrates may only require 1 coat; very dense substrates may require 3 coats. To ensure proper penetration, a field mock up is recommended.
- C. Placement Procedure: The SACI shall be applied liberally and allowed to soak into the substrate. This shall be accomplished by the use of brushes, rollers, low pressure gun or airless spray equipment.
- D. On vertical surfaces, apply the product from the top down in successive passes until the targeted consumption for the first coat is achieved.
- E. Successive passes are done when the concrete surface still has a matt appearance from the product, but is no longer wet (e.g. when placing the bare hand on the surface and removing it, no wetness on the hand is observed). The concrete surface is assumed to be saturated with the SACI when it remains "wet" in appearance for at least 5 seconds.
- F. The following coat can then be applied when the concrete is completely dry.
- G. On horizontal surfaces, saturate the substrate by continuous spray (airless or low pressure gun) or flooding technique and allow to have "wet" look for at least 5 seconds.
- H. On soffit areas, apply the material with a continuous spray and saturate the substrate until surface keeps its "wet" look for at least 5 seconds.
- I. Adhere to all limitations and cautions for the SACI product as stated in the manufacturers printed literature.
- J. Do not apply the SACI in case of imminent rain (within the next few hours), strong wind exceeding 30 mph or in strong direct sun light.

### 3.06 APPLICATION OF SEALANTS

- A. Provide the approved sealant system where shown on the Drawings, and in strict accord with the manufacturer's recommendations as approved by the Architect.
- B. Install sealant immediately after joint preparation. Mix and apply multi-component sealants in accord with manufacturer's printed instructions.
- C. Install sealant to fill joints completely from the back, without voids or entrapped air, using proven techniques, proper nozzles and sufficient force that result in sealants directly contacting and fully wetting joint surfaces.
- D. Install sealant to uniform cross-sectional shapes with depths relative to joint widths that allow optimum sealant movement capability as recommended by sealant manufacturer.
- E. Tool sealant in manner that forces sealant against back of joint, ensures firm, full contact at joint interfaces and leaves a finish that is smooth, uniform and free of ridges, wrinkles, sags, air pockets and embedded impurities.

- F. Remove sealant from adjacent surfaces in accord with sealant and substrate manufacturer recommendations as work progresses.
- G. Protect joint sealants from contact with contaminating substances and from damages. Cut out, remove and replace contaminated or damaged sealants, immediately, so that they are without contamination or damage at time of substantial completion.

### 3.07 FIELD QUALITY CONTROL

- A. Notify Architect when sections of work are complete to allow review prior to covering completed Work.
- B. Cooperate with Owner's inspection agency as applicable, who will observe substrate and coating installation and provide written documentation of observations.

### 3.08 CLEANING

- A. Remove uncured materials from tools or other surfaces with an approved solvent.
- B. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.

### 3.09 PROTECTION

- A. Cap and protect exposed back-up walls against moisture and wet weather conditions during and after application of membrane. Protect Work against wet weather conditions for a minimum of 24 hours.

**END OF SECTION 03911**

## SECTION 03930 - CONCRETE REHABILITATION

### PART 1 – GENERAL

#### 1.01 SUMMARY

- A. This specification describes the patching of interior and/or exterior vertical and overhead surfaces with a rapid setting, Portland cement mortar.

#### 1.02 QUALITY ASSURANCE

- A. Manufacturing qualifications: The manufacturer of the specified product shall be ISO 9001 certified and have in existence a recognized ongoing quality assurance program independently audited on a regular basis.
- B. Contractor qualifications: Contractor shall be qualified in the field of concrete repair and protection with a successful track record of 5 years or more. Contractor shall maintain qualified personnel who have received product training by a manufacturer's representative
- C. Install materials in accordance with all safety and weather conditions required by manufacturer or as modified by applicable rules and regulations of local, state and federal authorities having jurisdiction. Consult Material Safety Data Sheets for complete handling recommendations.

#### 1.03 DELIVERY, STORAGE, AND HANDLING

- A. All materials must be delivered in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers. Damaged material must be removed from the site immediately.
- B. Store all materials off the ground and protect from rain, freezing or excessive heat until ready for use.
- C. Condition the specified product as recommended by the manufacturer.

#### 1.04 JOB CONDITIONS

- A. Environmental Conditions: Do not apply material if it is raining or snowing or if such conditions appear to be imminent. Minimum application temperature 45°F and rising.
- B. Protection: Precautions should be taken to avoid damage to any surface near the work zone due to mixing and handling of the specified material.

#### 1.05 SUBMITTALS

- A. Submit two copies of manufacturer's literature, to include: Product Data Sheets, and appropriate Material Safety Data Sheets (MSDS).

#### 1.06 WARRANTY

- A. Provide a written warranty from the manufacturer against defects of materials for a period of one (1) years, beginning with date of substantial completion of the project.

### PART 2 - PRODUCTS

## 2.01 MANUFACTURER

- A. SikaQuick VOH, as manufactured by Sika Corporation, is considered to conform to the requirements of this specification.

## 2.02 MATERIALS

### A. General

1. The material shall be a blend of selected Portland cements, specially graded aggregates admixtures for controlling setting time, water reducers for workability, and an organic accelerator.
2. The materials shall be non-combustible, both before and after cure.
3. The materials shall be supplied in a factory-blended bag.
4. The rapid-setting cement mortar must be placeable from 1/8-in. to 3-in. in depth per lift for vertical applications and to 2-in. in depth per lift for overhead applications.

## 2.03 PERFORMANCE CRITERIA

### A. Typical Properties of the material:

1. Working Time: Approximately 20 minutes
2. Color: concrete gray

### B. Typical Properties of the cured material (mortar):

1. Compressive Strength (ASTM C-109)
  - a. 3 hours: 1,000 psi min
  - b. 1 day: 3,000 psi min.
  - c. 7 day: 5,000 psi min.
  - d. 28 day: 6,000 psi min.
2. Flexural Strength (ASTM C-78) @ 28 days: 1,000 psi
3. Splitting Tensile Strength (ASTM C-496) @ 28 days 500 psi
4. Bond Strength (ASTM C-882 Modified) @ 28 days: 2,400 psi
5. The Portland cement mortar shall not produce a vapor barrier.
6. Density (wet mix): approximately 125 lbs. / cu. ft.
7. Permeability (ASTM C-1202) @ 28 days Approximately <1000 Coulombs
8. Shrinkage, (ASTM C157: ICRI protocol) @ 28 days: <0.05%

Note: Tests above were performed with the material and curing conditions @ 71°F – 75°F and 45-55% relative humidity.

## PART 3 – EXECUTION

### 3.01 SURFACE PREPARATION

- A. Areas to be repaired must be clean, sound, and free of contaminants. All loose and deteriorated concrete shall be removed by mechanical means. Mechanically prepare the concrete substrate to obtain a surface profile of +/- 1/16" (CSP 5 or greater as per ICRI Guidelines) with a new exposed aggregate surface. Area to be patched shall not be less than 1/8" in depth.
- B. Where reinforcing steel with active corrosion is encountered, sandblast the steel to a white metal finish to remove all contaminants and rust. Where corrosion has occurred

due to the presence of chlorides, the steel shall be high pressure washed after mechanical cleaning. Prime steel with 2 coats of Sika Armatec 110 EpoCem as directed by manufacturer. (See Spec Component SC-201-0699) Armatec 110 must be completely cured before application of SikaQuick VOH

### 3.02 MIXING AND APPLICATION

- A. Mechanically mix in appropriately sized mortar mixer or with a Sika jiffy paddle and low speed (400-600 rpm) drill. Pour 6 pints of water into the mixing container. Add the powder while continuing to mix. Mix to a uniform consistency for a maximum of three minutes. Adjust the water dosage by a maximum amount of +/- ½ pint, if necessary, to achieve the desired consistency. Should smaller quantities be needed, be sure the proper water/powder ratio is maintained and that the dry material is uniformly blended before mixing the components together. Mix only that amount of material that can be placed in 20 minutes. Do not retemper material.
- B. Placement Procedure: At the time of application, the substrate should be saturated surface dry with no standing water. Mortar must be scrubbed into substrate filling all pores and voids. While the scrub coat is still plastic, force material against edge of repair, working toward center. After filling, consolidate, then trowel. Allow mortar to set to desired stiffness, then finish with a trowel for a smooth surface. Broom or burlap drag for rough surface. Where multiple lifts are required, score top surface in each lift to produce a roughened substrate for next lift. Allow preceding layers to harden before applying fresh material. Saturate surface of the lift with clean water. If previous layers are over 6 hours old, mechanically prepare the substrate and dampen.
- C. As per ACI recommendations for Portland cement concrete, curing is required. Moist cure with wet burlap and polyethylene, a fine mist of water or a water-based\* compatible curing compound. Moist curing should commence immediately after finishing. Protect newly applied material from rain, sun, wind and frost. To prevent from freezing cover with insulating material. Setting time is dependent on temperature and humidity.

\*Pretesting of curing compound is recommended.

- D. Adhere to all procedures, limitations and cautions for this product in the manufacturers current printed technical data sheet and literature.

### 3.05 CLEANING

- A. The uncured material can be cleaned from tools with water. The cured cement mortar can only be removed mechanically.
- B. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.

## SECTION 05720 – ALUMINUM PIPE RAILING

### PART 1 – GENERAL

#### 1.01 WORK INCLUDED

- A. Furnish and install Component type aluminum handrails, guardrails, and railing systems, including connectors, fasteners, and system required accessories.

#### 1.02 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

- A. Furnish anchors for placement in wood blocking, Section 06100.

#### 1.03 RELATED WORK

- A. Section 03000 - Concrete:
- B. Section 03300 - Cast-in-Place Concrete:
- C. Section 06100 - Rough Carpentry:

#### 1.04 REFERENCES

- A. Aluminum Association (AA)
  - 1. ASD-1 Aluminum Standards and Data
- B. American National Standards Institute (ANSI)
  - 1. A21 .1 Safety Requirements for Floor and Wall Openings, Railings and Toe Boards.
  - 2. A58.1 Minimum Design Loads in Buildings and Other Structures.
  - 3. AI 17.1 Accessible and Usable Buildings and Facilities.
- C. American Society for Testing and Materials (ASTM)
  - 1. B 429 Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
  - 2. E 894 Standard Test Methods for Anchorage of Permanent Metal Railing Systems and Rails for Buildings.
  - 3. E 935 Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
- D. National Association of Architectural Metal Manufacturers (NAAMM)
  - 1. Pipe Railing Manual
- E. National Ornamental and Miscellaneous Metals Association (NOMMA)
  - 1. Metal Rail Manual

#### 1.05 PERFORMANCE REQUIREMENTS

- A. General: In engineering handrail and railing systems to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
  - 1. Aluminum: AA "Specifications for Aluminum Structures."
- B. Structural Performance of Handrails and Railing Systems: Engineer, fabricate, and install handrails and railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials for handrails, railing systems, anchors, and connections. Apply each load to produce the maximum



stress in each of the respective components comprising handrails and railing systems.

1. Toprail of Guardrail System: Capable of withstanding the following loads applied as indicated:
    - a. Uniform load of 50 pounds per lineal foot applied horizontally at right angles to the top rail.
    - b. 250 lb concentrated load horizontally.
  2. Infill Area of Guardrail Systems: Capable of withstanding the following loads applied as indicated:
    - a. Concentrated load of 25 pounds per square foot applied horizontally at right angles over the entire tributary area, including openings and spaces between rails.
    - b. Reactions due to the above load need not be combined with those loads on the toprail of guardrail system.
  3. Handrails, when shown: The mounting of handrails shall be such that the completed handrail and supporting structure are capable of withstanding the following loads applied as indicated:
    - a. Concentrated load of 250 pounds applied in any direction at any point on the handrail.
    - b. These loads shall not be assumed to act cumulatively with those loads on the infill area of guardrail system.
- C. Thermal Movements: Allow for thermal movement resulting from the following maximum change (60 degrees) in ambient temperature in engineering, fabricating, and installing of joints, overstressing of components and connections, and other detrimental effects. Base engineering calculations on actual surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.
1. Temperature Change: 60 degree range from ambient to surface of material.
- D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

#### 1.06 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01300.
- B. Indicate component details, materials, finishes, connection and joining methods, and the relationship to adjoining work.
- C. Submit manufacturer's installation instructions under provisions of Section 01300.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the job site in good condition and properly protected against damage to finished surfaces.
- B. Storage on site:
  1. Store material in a location and in a manner to avoid damage. Stacking shall be done in a way that will prevent bending.
  2. Store material in a clean, dry location away from uncured concrete and masonry. Cover with waterproof paper, tarpaulin, or polyethylene sheeting in a manner that will permit circulation of air inside the covering.
- C. Keep handling on site to a minimum. Exercise particular care to avoid damage to finishes of material.

## PART 2 - PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURER

- A. Manufacturers: Subject to compliance with requirements, provide handrails and railing systems by one of the following:
1. Aluminum Ornamental Railing Systems:
    - a. Williams Fence and Aluminum  
8229 Hwy 71 South  
Lecompte, LA 71346  
318-448-4390  
[Williamsfenceandaluminum.com](http://Williamsfenceandaluminum.com)
    - b. ALUMINUM TUBE RAILINGS manufactured by  
ATR Technologies, Inc.  
805 Towne Center Drive  
Pomona, CA 91767-5901  
Toll Free Phone: (800) 423-4148  
Fax: (909) 399-5834  
Website: [www-ATR-Technologies.com](http://www-ATR-Technologies.com)  
Email: [railings@ATR-Technologies.com](mailto:railings@ATR-Technologies.com)
    - c. Ideal Shield  
2525 Clark St.  
Detroit, MI 48209-1355  
Toll Free Phone: (800) 781-1722  
Website: [www.idealshield.com](http://www.idealshield.com)
    - d. C.R. Laurence Company, Inc.  
Toll Free Phone: (800) 421-6144  
Website: [www.crlaurence.com](http://www.crlaurence.com)
  - B. Requests for substitutions will be considered in accordance with provisions of Section 01600.
  - C. Provide all handrails, guardrails, and railing systems from a single manufacturer.

### 2.02 METALS

- A. General: Provide metal free from surface blemishes where exposed to view in the finished unit. Exposed-to-view surfaces exhibiting pitting, seam marks, roller marks, stains, discolorations, or other imperfections on finished units are not acceptable.
- B. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of the alloy and temper designated below for each aluminum form required:
1. Extruded Bar and Tube: ASTM B 221, Alloys 6005-T5, 6061-T6 and 6063-T6.
  2. Extruded Structural Pipe and Tube: ASTM 429, Alloy 6063-T6
  3. Drawn Seamless Tube: ASTM B 210, 6063-T832.
  4. Plate and Sheet: ASTM B 209, Alloys 6061-T6 and 6063-T6.
  5. Die and Hand Forging: ASTM B 247, 6061-T6.
  6. Castings: ASTM B 26, A356-T6.

## 2.03 RAILING SYSTEM

- A. Material shall conform to 2.02 and be finished in accordance with 2.07.
- B. Railing system shall be permanently anchored.
- C. Top Rails, Handrails and/or Grip Rails, Mid Rails and Posts
  - 1. Fabricate from anodized 1-1/2 inch Schedule 40 aluminum pipe.
  - 2. If required, provide post reinforcement to meet loading criteria.
- D. Fittings and Fasteners: Same basic material and alloy as parts being joined, unless otherwise indicated. Do not use metals that will be corrosive or incompatible with materials being fastened; do not utilize cast fittings.
  - 1. Component Fittings: Machined from solid extruded 6063-T6 aluminum alloy and finished to match the pipe.
  - 2. Fasteners: Screws shall be fabricated from minimum type 304 stainless steel.
- E. Transitions
  - 1. Formed with uniform radius bend within allowable tolerance of pipe size.
  - 2. If required, formed with mitered, non-welded, hair-line joints.
- F. Connection Splices
  - 1. Internal mechanical connection splices shall be of extruded aluminum.
- G. Base Flanges, Anchors, and Inserts:
  - 1. Refer to drawings.
  - 2. Anchors and inserts as required to support work specified, in accordance with approved shop drawings.
- H. Mounting Wall Brackets
  - 1. Wall mounted brackets shall be of aluminum attached to bottom side of Handrail and/or Grip rail by means of mechanical attachment.

## 2.04 FASTENERS

- A. Fasteners for Anchoring Railings to Other Construction: Select fasteners of the type, grade, and class required to produce connections that are suitable for anchoring railing to other types of construction indicated and capable of withstanding design loadings.
  - 1. For aluminum railings, provide fasteners fabricated from type 304 stainless steel.
- B. Cast-in-Place and Post-Installed Anchors: Anchors of type indicated below, fabricated for corrosion-resistant materials with capability to sustain, without failure, the loads determined by local code requirements.
  - 1. List anchors required.

## 2.05 GROUT AND ANCHORING CEMENT

- A. Non-shrink, Non-metallic Grout: Premixed, factory-packaged, non-shrink, non-metallic, non-staining, non-corrosive grout. Provide grout specifically recommended by manufacturer for interior or exterior applications. Minimum 28 day compressive strength of 5,000 psi.
- B. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Erosion-Resistant Anchoring Cement:
    - a. EMACO ® GRIP by BASF Building Systems
    - b. QUIKRETE® Commercial Grade FastSet™ by The QUIKRETE Companies

## 2.05 FABRICATION

- A. Fabricate handrails and railing systems with architectural welded, non-welded, internal and mechanical connections to comply with manufacturer's printed requirements, project design requirements, details, dimensions, finish and member sizes, including post spacing and anchorage, but not less than the structural requirements to support loading.
  - 1. Clearly mark component units for site assembly and installation.
  - 2. Use connections that maintain structural capacity of joined members.
- B. Form all changes in rail direction by architectural welds or hairline mechanical joints in allowable tolerance of pipe size.
- C. Cut materials square and remove burrs from all exposed edges, with no chamfer.
- D. Make exposed joints butt tight and flush.
- E. Close exposed visible ends of Top Rails and Handrails by use of flat domed end cap.
- F. Verify dimensions on site prior to shop fabrication.
- G. Posts: All posts are to be fully welded to aluminum rails.

## 2.07 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage per manufacturer's recommendations.
- C. Appearance of Finished Work: Architectural Grade
- D. All railings to be powder coated after fabrication.

## 2.08 ALUMINUM FINISH

- A. Finish designations prefixed AAMA conform to the system established by the American Architectural Manufacturers Association.
- B. Painted finish shall be a type that meets the requirements of AAMA 2603-02 (Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels). One of the following applications may be used:
  - 1. Finish shall be an exterior quality power coating applied in accordance with AAMA 2603-02.
    - [Tiger Drylac: [TGIC Polyester]]
    - [Dupont Powder Coatings: [Polyester]]
    - [Morton Powder Coatings: [Polyester]]
    - [Spraylat: [Polyester]]
    - [Other manufacturers with product information indicating compliance with AAMA 2603-02.]
- C. Color:
  - For organic coatings: As selected from manufacturer's standard colors*

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Examine system components, substrate, and conditions where railing systems are to be installed.
- B. Notify architect in writing of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. Prepare surrounding construction to receive railing system installations to comply with manufacturer's requirements.

### **3.03 DISSIMILAR METALS**

- A. When aluminum components come into contact with dissimilar metals, surfaces shall be kept from direct contact by painting the dissimilar metal with a heavy coat of a epoxy/polyurethane or provide a heavy vinyl tape barrier.
- B. When aluminum components come into contact with cement or lime mortar, exposed aluminum surfaces shall be separated by means of epoxy/polyurethane, heavy vinyl tape or other approved method to prevent electrolytic action.

### **3.04 INSTALLATION**

- A. Install railing system and related components in accordance to shop drawings and to manufacturer's instructions.
- B. Preassemble railing system, including posts, in easy to lift sections whenever possible.
- C. Adjust, level, and securely install railing system components.
  - 1. Avoid springing assembled components of system into place.
- D. Provide for thermal expansion and contraction by use of expansion joints/gaps in top rails at 80 foot to 120 foot intervals.
  - 1. Strictly adhere to manufacturer's instructions for locating and fastening expansion joints.
- E. Do not provide weep holes in hollow sections of railing.

### **3.05 CLEANING**

- A. As installation is completed, wash thoroughly using plain water containing a mild soap or detergent. When preferred, an anodized finish shall be cleaned with white gasoline, kerosene or distillate. Aluminum with a painted finish shall be cleaned with plain water containing a mild soap or detergent.
- B. Do not use an acid solution, steel wool or other harsh abrasives.
- C. If stains remain after washing, remove paint finish and restore in accordance with NAAMM Metal Finishes Manual. Finish must not be removed from anodized aluminum. Reanodizing can only be done by removing railing and returning it to the anodizer.

3.06 PROTECTION

- A. Provide adequate protection for all surfaces of completed installations to prevent damage during remainder of construction activities.

3.07 REPAIR OF DEFECTIVE WORK

- A. Remove stained or otherwise defective work and replace with material that meets specification requirements.

**END OF SECTION 05720**

## SECTION 06100 - ROUGH CARPENTRY

### PART 1 GENERAL

#### 1.01 WORK INCLUDED:

- A. Comply with requirements of the Contract Documents and all applicable codes and regulations to provide rough carpentry, in the types and arrangements shown on the Drawings, as specified herein and as needed for a complete and proper installation.

#### 1.02 RELATED WORK:

- A. Comply with the relative requirements of other Divisions, Sections, the General and Supplementary Conditions and the Drawings of the entire Contract Documents.
- B. The breakdown of this project manual into Divisions and Sections shall not define any limit of work.

#### 1.03 QUALITY ASSURANCE:

- A. Comply with recommendations and requirements of referenced standards and with all applicable codes and regulations.
- B. Lumber Grading Rules and Wood Species: In conformance with Voluntary Product Standard PS 20.
- C. Plywood Grading Rules: Softwood Plywood, Construction and Industrial, Product Standard PS 1.
- D. Grade Marks: Identify all lumber and plywood by official grade mark.

#### 1.04 REFERENCES:

- A. "Standard Grading Rules for Western Lumber", G-5, as published by Western Wood Products Association. (WWPA)
- B. "APA Product Guide: Grades & Specifications", as published by the American Plywood Association. (APA)
- C. "National Design Specification for Stress Grade Lumber and Its Fastenings", as published by the National Forest Products Association. (NFPA)
- D. "Standard Grading Rules for Southern Pine Lumber", by Southern Pine Inspection Bureau. (SPIB)
- E. "Standards for Softwood Lumber, Timber and Plywood, Pressure Treated with Water-Borne Preservatives", LP-2 and LP-22, by American Wood Preservers Bureau. (AWPB)

#### 1.05 SUBMITTALS:

- A. Pressure Treated Wood: Submit certification by treating plant stating chemicals and process used, net amount of salts retained, and conformance with AWPA Standards, and that moisture content was reduced to 19% maximum, after treatment.
- B. Samples: Submit all samples requested by Architect.

**1.06 PRODUCT DELIVERY, STORAGE AND HANDLING:**

- A. Comply with requirements of Section 01600.
- B. Immediately upon delivery to job site, place materials in area protected from weather.
- C. Store materials a minimum of 6 inches above ground on framework or blocking and cover with protective waterproof covering providing for adequate air circulation or ventilation.

**PART 2 PRODUCTS****2.01 LUMBER, GENERAL:**

- A. Dimensions: Specified lumber dimensions are nominal. Actual dimensions conform to industry standards.
- B. Moisture Content: KD15 or MC15 or better.
- C. Surfacing: Surface four sides (S4S), unless specified otherwise.

**2.02 STUDS:**

- A. SPIB No.1 KD SYP or SPIB No.2 KD SYP, select on job to eliminate through holes and wild grain that will affect structural capabilities.

**2.03 RAFTERS, JOISTS:**

- A. SPIB No.2 KD SYP, Big Mill Stock, No thru holes.

**2.04 BRACING, BLOCKING, AND GENERAL UTILITY, NON-EXPOSED:**

- A. SPIB No.2 KD.

**2.05 PLATES AND BLOCKING:**

- A. Refer to Section 2.09. Pressure Treated Wood Products.

**2.06 PLYWOOD:**

- A. Plywood Roof Sheathing: APA Rated Sheathing, Exterior, Exposure 1, 5/8" thick.

**2.07 VAPOR BARRIER:**

- A. Tyvec Commercial Wrap.

**2.08 ROUGH HARDWARE AND MISCELLANEOUS:**

- A. Nails:
  - 1. Common wire, galvanized for exterior work.
- B. Screws:
  - 1. Standard domestic manufacture, bright steel, except galvanized for exterior use and of brass, bronze, aluminum, or stainless steel, when attached to items made of those materials.
- C. Bolts:



1. Standard mild steel, square head machine bolts with square nuts and malleable iron or steel plate washers or carriage bolts with square nuts and cut washers where applicable.
  2. Bolts, nuts, and washers, wholly or partially exposed on exterior shall be galvanized.
- D. Toggle Bolts:
1. FS FF-B-561.
- E. Expansion Shields, Lag Screws and Bolts:
1. FS FF-B-561.
- F. Staples:
1. FS FF-N-105.
- G. Lag Screws:
1. Conform to requirements of NFPA.

## 2.09 PRESSURE TREATED WOOD PRODUCTS:

- A. Provide pressure treated wood products as follows:
1. AWPB, LP-22 Standard:
    - a. For all framing, plates, blocking and nailing strips, etc., in contact with masonry, concrete, steel, or the ground, as required on Drawings or by job conditions.
  2. AWPB, LP-2 Standard:
    - a. For all nailers for metal flashing, fascia and wood exposed to weather conditions, except redwood or cedar surfaces, as required in Drawings or by job conditions.
    - b. Apply two coats of same preservative used in original treatment to all sawed or cut surfaces of treated lumber.

## PART 3 EXECUTION

### 3.01 ERECTION:

- A. General:
1. Verify that surfaces to receive rough carpentry materials are prepared to exact grades and dimensions and are free of irregularities and debris.
- B. Plates and Stud Members:
1. Provide single bottom plate and double top plates for all partitions.
  2. Provide studs in continuous lengths without splices; toenail to bottom plate and endnail to lower top plate.
  3. Overlap double top plates width of member at corner and intersections; face nail upper top plate to lower top plate.
  4. Anchor bottom plate to concrete structure with anchor bolts with washers at exterior walls and with anchor bolts or power driven anchors at interior partitions, spaced 4 feet o.c., unless otherwise noted on drawings.
  5. Double studs at openings, triple studs at tees and corners.
- C. Headers:
1. Continuous headers, same width as studs, depth required to span widest opening. Toenail headers to studs and opening framing.
  2. Stagger joints in individual header members a minimum of three stud spaces, allowing no joints to occur over openings.
  3. Lap headers at intersections with bearing partitions or tie with metal straps.

4. Install opening headers as follows:
    - a. spans to 3 feet, two 2x4;
    - b. spans to 4 2 feet, two 2x6;
    - c. spans to 6 feet, two 2x8;
    - d. spans to 8 feet, two 2x10.
  - D. Blocking:
    1. Wedge, align, and anchor blocking with countersunk bolts, washers and nuts, or nails.
    2. Locate blocking to facilitate installation of finishing materials, fixtures, specialty items, and trim.
  - E. Framing for Mechanical Work:
    1. Frame members for passage of pipes and ducts to avoid cutting structural members.
    2. Do not cut, notch, or bore framing members for passage of pipes or conduits without approval of Architect.
- 3.02 CLEANING:
- A. Remove all excess materials and debris from site.

**END OF SECTION 06100**

## SECTION 07192 - SILOXANE MASONRY WATERPROOFING

### PART 1 – GENERAL

#### 1.01 TEST AREA

- A. Test a minimum 4 ft. by 4 ft. area on each type of masonry. Use the manufacturer's application instructions. Let test area protective treatment cure before inspection. Keep test panels available for comparison throughout the protective treatment project.

### PART 2 – PRODUCTS

#### 2.01 MANUFACTURER

- A. PROSOCO, Inc., 3741 Greenway Circle, Lawrence, KS 66046. Phone: (800) 255-4255; Fax: (785) 830-9797. E-mail: [CustomerCare@prosoco.com](mailto:CustomerCare@prosoco.com)
- B. Product Description
  1. Sure Klean® Weather Seal Siloxane PD, or equal, ready to-use, water-based silane/siloxane water repellent.
- C. Typical Technical Data
  1. FORM: cloudy white liquid, odorless
  2. SPECIFIC GRAVITY: 0.996
  3. pH: 4 to 5
  4. WEIGHT/GALLON: 8.29 pounds
  5. ACTIVE CONTENT: 7 percent
  6. TOTAL SOLIDS: 4 percent ASTM D5095
  7. FLASH POINT: greater than 212 degrees F ASTM D 3278
  8. FREEZE POINT: 32 degrees F
  9. SHELF LIFE: 1 year in tightly sealed, unopened container
  10. VOC CONTENT: Complies with all known national, state and district AIM VOC regulations.
- D. LIMITATIONS
  1. Will not keep water out of cracks, defects or open joints.
  2. Not recommended for below grade application.
  3. Not suitable for application to synthetic resin paints, gypsum or other non-masonry surfaces.

### PART 3 – EXECUTION

#### 3.01 APPLICATION

- A. Before applying, read "Preparation" and "Safety Information" sections in the Manufacturer's Product Data Sheet. Refer to the Product Data Sheet for additional information about application. Do not dilute or alter.

#### 3.02 VERTICAL APPLICATION INSTRUCTIONS

- A. For best results, apply protective treatment "wet-on-wet" to a visibly dry and absorbent surface.

- B. Spray: Saturate from the bottom up, creating a 4-inch to 8-inch rundown below the spray contact point. Let the first application penetrate for 5 to 10 minutes. Re-saturate. Less will be needed for the second application.
- C. Brush or Roller: Saturate uniformly. Let protective treatment penetrate for 5 to 10 minutes. Brush out heavy runs and drips that don't penetrate.

### 3.03 DENSE SURFACE APPLICATION INSTRUCTIONS

- A. Apply in a single, saturating application with no run down. Back roll all runs and drips to ensure uniform appearance. DO NOT OVER APPLY. One application is normally enough. Always test.

### 3.04 HORIZONTAL APPLICATION INSTRUCTIONS

- A. Saturate in a single application. Use enough to keep the surface wet for 2 to 3 minutes before penetration.
- B. Broom out puddles until they soak in.

### 3.05 DRYING TIME

- A. Treated surfaces dry to touch in 1 hour.
- B. Protect surfaces from rainfall for 6 hours following treatment.
- C. Protect from foot and vehicle traffic until visibly dry.
- D. Siloxane PD gains its water repellency properties in 72 hours.

### 3.06 CLEANUP

- A. Clean tools, equipment and over spray with soap and warm water.

**END OF SECTION 07192**

## SECTION 07531 FULLY ADHERED PVC MEMBRANE SPECIFICATION FOR LOW SLOPE ROOFS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. 50 mil Fleece back PVC membrane adhered with two (2) component membrane adhesive; splatter applied.
- B. DensDeck® Prime Roof Board, attached with two (2) component elastomeric froth insulation adhesive.
- C. EPS Type II (tapered), attached with two (2) component elastomeric froth insulation adhesive.
- D. Prefabricated flashings, corners, parapets, stacks, vents, and related details.
- E. Fasteners, adhesives, and other accessories required for a complete roofing installation.
- F. Traffic Protection.

#### 1.02 REFERENCES

- A. NRCA - The NRCA Roofing and Waterproofing Manual.
- B. ASCE 7 - Minimum Design Loads For Buildings And Other Structures.
- C. UL - Roofing Materials and Systems Directory, Roofing Systems (TGFU.R10128).
- D. ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- E. ASTM D 751 - Standard Test Methods for Coated Fabrics.
- F. ASTM D 4434 - Standard Specification for Poly(Vinyl Chloride) Sheet Roofing.
- G. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings.
- H. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

#### 1.03 SYSTEM DESCRIPTION

- A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.
- C. Physical Properties:
  - 1. Roof product must meet the requirements of Type III PVC sheet roofing as defined by ASTM D 4434 and must meet or exceed the following physical properties.
  - 2. Thickness: 50 mil (68 mil including fleece), nominal, in accordance with ASTM D 751.
  - 3. Thickness Over Scrim:  $\geq 26$  mil in accordance with ASTM D 751.
  - 4. Breaking Strengths:  $\geq 500$  lbf. (MD) and  $\geq 344$  lbf. (XMD) in accordance with ASTM D 751, Grab Method.
  - 5. Elongation at Break:  $\geq 32\%$  (MD) and  $\geq 77\%$  (XMD) in accordance with ASTM D 751, Grab Method.
  - 6. Heat Aging in accordance with ASTM D 3045: 176 °F for 56 days. No sign of cracking, chipping or crazing. (In accordance with ASTM D 4434).
  - 7. Factory Seam Strength:  $\geq 278$  lbf. in accordance with ASTM D 751, Grab Method.

8. Tearing Strength:  $\geq 67$  lbf. (MD) and  $\geq 160$  lbf. (XMD) in accordance with ASTM D 751, Procedure B.
  9. Low Temperature Bend (Flexibility): Pass at  $-40$  °F in accordance with ASTM D 2136.
  10. Accelerated Weathering: No cracking, checking, crazing, erosion or chalking after 5,000 hours in accordance with ASTM G 154.
  11. Linear Dimensional Change:  $\leq 0.11\%$  (MD) and  $0.11\%$  (XMD) in accordance with ASTM D 1204 at  $176 \pm 2$  °F for 6 hours.
  12. Water Absorption:  $\leq 2.7\%$  in accordance with ASTM D 570 at  $158$  °F for 166 hours.
  13. Static Puncture Resistance:  $\geq 33$  lbs. in accordance with ASTM D 5602.
  14. Dynamic Puncture Resistance:  $\geq 14.7$  ft-lbf. in accordance with ASTM D 5635.
- D. Cool Roof Rating Council (CRRC):
1. Membrane must be listed on CRRC website.
    - a. Initial Solar Reflectance:  $\geq 87\%$
    - b. Initial Thermal Emittance:  $\geq 89\%$
    - c. Initial Solar Reflective Index (SRI):  $\geq 110$
- E. Insulation
1. Provide overall thermal resistance for roofing system as follows:
    - a. Minimum Thickness:  $1 \frac{1}{2}$  inch.
  2. Tapered Insulation Slope:  $1/8$  inch per foot.
  3. Configuration as indicated on the Drawings.

#### 1.04 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Manufacturer data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
  2. Storage and handling requirements and recommendations.
  3. Installation methods.
  4. Maintenance requirements.
- C. Shop Drawings: Indicate insulation pattern, overall membrane layout, field seam locations, joint or termination detail conditions, and location of fasteners.
- D. Verification Samples: For each product specified, two samples, representing actual product, color, and finish.
1. 4 inch by 6 inch sample of roofing membrane, of color specified.
  2. 4 inch by 6 inch sample of walkway pad.
  3. Termination bar, fascia bar with cover, drip edge and gravel stop if to be used.
  4. Each fastener type to be used for installing membrane, insulation/recover board, termination bar and edge details.
- E. Installer Certification: Certification from the roofing system manufacturer that Installer is approved, authorized, or licensed by manufacturer to install roofing system, and meets Section 1.05 Quality Assurance.
- F. Manufacturer's warranties.

#### 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Installers must hold: Manufacturer's installer must be verified to be approved, authorized or licensed to install manufacturer's product, and currently hold the highest quality certification by manufacturer, example (Master Elite) certification by the roofing system manufacturer. Installer must also be verified to have successfully installed a minimum of 100,000 sf. of the proposed roof system within the last 36 months and under manufacturer's warranty. Installer shall also have a minimum of 15 warrantied PVC roof systems in place within the last 36 months.

- Installer's main office shall be located no more than 125 miles radius from the project site city.
- B. Perform work in accordance with manufacturer's installation instructions.
  - C. Manufacturer Qualifications: A manufacturer specializing in the production of PVC membranes systems and utilizing a Quality Control Manual during the production of the membrane roofing system that has been approved by and is inspected by Underwriters Laboratories.
  - D. Source Limitations: Obtain components for membrane roofing system from roofing membrane manufacturer.
  - E. There shall be no deviations from the roof membrane manufacturer's specifications or the approved shop drawings without the prior written approval of the manufacturer.

#### 1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable code for roof assembly wind uplift and fire hazard requirements.
- B. Fire Exposure: Provide membrane roofing materials with the following fire-test-response characteristics. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
  - 1. Exterior Fire-Test Exposure:
    - a. Class A; ASTM E 108, for application and roof slopes indicated.
  - 2. Fire-Resistance Ratings: Comply with ASTM E 119 for fire-resistance-rated roof assemblies of which roofing system is a part.
  - 3. Conform to applicable code for roof assembly fire hazard requirements.
- C. Wind Uplift:
  - 1. Roofing System Design: Provide a roofing system designed to resist uplift pressures calculated according to the current edition of the ASCE-7 Specification *Minimum Design Loads for Buildings And Other Structures*, for this wind zone plus fifteen percent (15%).

#### 1.07 PRE-INSTALLATION MEETING

- A. Convene meeting not less than one week before starting work of this section.
- B. Review methods and procedures related to roof deck construction and roofing system including, but not limited to, the following.
  - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing installer, roofing system manufacturer's representative, deck installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
  - 2. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 3. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
  - 4. Review structural loading limitations of roof deck during and after roofing.
  - 5. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
  - 6. Review governing regulations and requirements for insurance and certificates if applicable.
  - 7. Review temporary protection requirements for roofing system during and after installation.
  - 8. Review roof observation and repair procedures after roofing installation.

## 1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Store roof materials and place equipment in a manner to avoid permanent deflection of deck.
- E. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

## 1.09 WARRANTY

- A. Contractor's Warranty: The contractor shall warrant the roof application with respect to workmanship and proper application for two (2) years from the effective date of the warranty issued by the manufacturer.
- B. Manufacturer's Warranty: Must be no-dollar limit type and provide for completion of repairs, replacement of membrane or total replacement of the roofing system at the then-current material and labor prices throughout the life of the warranty. In addition the warranty must meet the following criteria:
  - 1. Warranty Period: 20 years from date issued by the manufacturer.
  - 2. No exclusion for damage caused by ponding water.
  - 3. No exclusion for damage caused by biological growth.
  - 4. Issued direct from and serviced by the roof membrane manufacturer.
  - 5. Transferable for the full term of the warranty.
  - 6. No additional charge for the warranty.

## PART 2 PRODUCTS

### 2.01 MANUFACTURER

- A. For the purposes of establishing a minimum standard of quality, this specification is written around Duro-Last Roofing products.
- B. Manufacturer: Duro-Last Roofing, Inc., which is located at: 525 Morley Drive, Saginaw, MI 48601. Telephone: 800-248-0280.
- C. All roofing system components to be provided or approved by the manufacturer.

### 2.02 OTHER ACCEPTABLE MANUFACTURERS

- A. Other acceptable manufacturers shall be Sarnafil S327 EnergySmart membrane 60 mil. and Carlisle Syntec Systems Sure-Flex PVC membrane 60 mil., provided these manufacturers can submit acceptable information certifying that all membrane, flashings, fasteners, slip sheets, insulation, metal fabrications, and any other auxiliary materials required to make up a complete roofing system, shall be covered under the 20 year NDL Warranty.



## 2.03 ROOFING SYSTEM COMPONENTS

- A. Specified components from Duro-Last.
- B. Roofing Membrane: fleece back membrane conforming to ASTM D 4434, type III, fabric-reinforced, PVC, NSF/ANSI 347 Gold or Platinum Certification, and a product-specific third-party verified Environmental Product Declaration. Membrane properties as follows:
  - 1. Thickness:
    - a. 50 mil nominal (68 mil including fleece).
  - 2. Exposed Face Color:
    - a. White.
  - 3. Minimum recycle content 7% post-industrial and 0% post-consumer.
  - 4. Recycled at end of life into resilient flooring or concrete expansion joints.
- C. Accessory Materials: Provide accessory materials supplied by or approved for use by the membrane manufacturer.
  - 1. Sheet Flashing: Manufacturer's standard reinforced PVC sheet flashing.
  - 2. Factory Prefabricated Flashings: manufactured using Manufacturer's standard reinforced PVC membrane.
    - a. Stack Flashings.
    - b. Curb Flashings.
    - c. Inside and Outside Corners.
  - 3. Sealants and Adhesives: Compatible with roofing system and supplied by the manufacturer or approved supplier and component.
    - a. Membrane Adhesive - Duro-Fleece® CR-20.
    - b. Insulation Adhesive - Duro-Grip Board Max. , Carlisle FAST, or SARACOL OM BOARD Adhesive.
    - c. Caulking - Duro-Caulk® Plus.
    - d. Strip Mastic.
  - 4. Slip Sheet: Compatible with roofing system and supplied by the manufacturer.
  - 5. Fasteners and Plates: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane and insulation to substrate. Supplied or warrantied by manufacturer.
  - 6. PV Anchors
  - 7. Termination and Edge Details: Supplied by Duro-Last Roofing, Inc. or approved supplier
    - a. Termination Bar.
    - b. Fascia Base with Kynar Steel Cover.
  - 8. Vinyl Coated Metal: Supplied by membrane manufacturer approved supplier 24 gauge, hot-dipped galvanized, grade 90 metal with a minimum of 17 mil of membrane laminated to one side.
  - 9. Contractor to replace all roof top roof accessories, including but not limited to roof vents, galvanized vent stacks, galvanized and insulated hot gas vent jacks, all shaped penetration jacks, etc.
- D. Walkways:
  - 1. Provide non-skid, maintenance-free walkway pads in areas of heavy foot traffic and around mechanical equipment.
    - a. Black and yellow 80 mil heat welded on the two (2) longer sides of Walkway Pad.

## 2.04 ROOF INSULATION

### A. General:

1. Provide preformed roof insulation boards that comply with requirements and referenced standards, as selected from manufacturer's standard sizes.
2. Provide preformed saddles, crickets, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

### B. Expanded Polystyrene (EPS) Board Insulation: Material as supplied by or from manufacturer's approved suppliers.

1. EPS Type II (tapered) 1.5 lb density minimum.

## 2.05 ROOF INSULATION ACCESSORIES

### A. General: Provide roof insulation accessories approved by the roof membrane manufacturer and as recommended by insulation manufacturer for the intended use.

### B. Insulation Adhesive: Provide two (2) component polyurethane froth insulation adhesive for attaching insulation and/or insulation cover boards in conformance to specified design requirements.

1. Duro-Grip® CR-20 insulation adhesive or approved equivalent.

### C. Insulation Cover Board:

1. Glass-mat-faced, water-resistant gypsum substrate conforming to ASTM C 1177/C 1177M, DensDeck® Prime Roof Board as manufactured by Georgia-Pacific Corporation.
  - a. ¼ inch thick.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that the surfaces and site conditions are ready to receive work.
- B. Verify that the deck is supported and secured.
- C. Verify that the deck is clean and smooth, free of depressions, waves, or projections, and properly sloped to drains, valleys, eaves, scuppers or gutters.
- D. Verify that the deck surfaces are dry and free of standing water, ice or snow.
- E. Verify that all roof openings or penetrations through the roof are solidly set.

### 3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Surfaces shall be clean, smooth, free of fins, sharp edges, loose and foreign material, oil, grease, and bitumen.
- D. Where roof drains occur at low roof/gym intersections, Contractor is to close off and span opening with 16 gauge STL plate prior to new roof installation.

### 3.03 INSTALLATION

- A. Install insulation in accordance with the roof manufacturer's requirements.
- B. Insulation: EPS Type II (tapered) 1.5 lb density.
  1. Install insulation in accordance with the roof manufacturer's requirements.
  2. Insulation shall be adequately supported to sustain normal foot traffic without damage.

3. Where field trimmed, insulation shall be fitted tightly around roof protrusions with no gaps greater than ¼ inch.
  4. Tapered insulation boards shall be installed in accordance with the insulation manufacture's shop drawings.
  5. No more insulation shall be applied than can be covered with the roof membrane by the end of the day or the onset of inclement weather.
  6. If more than one layer of insulation is used, all joints between subsequent layers shall be offset by at least a half (1/2) sheet.
- C. Insulation Cover Board: DensDeck® Prime Roof Board.
- D. Roof Membrane: 50 mil, Duro-Fleece™ membrane.
1. Use only membrane adhesive acceptable to the roof manufacturer's that meets the applicable design requirements.
  2. Cut membrane to fit neatly around all penetrations and roof projections.
  3. Unroll roofing membrane and positioned with a minimum 6 inch overlap along the selvage edge. Roll ends must be butted together and membrane of the same mil thickness, without fleece backing, must be used to form the end lap.
  4. Apply adhesive in accordance with the roof manufacturer's requirements.
  5. Apply adhesive in splatter pattern.
  6. Follow guidelines outlined in the adhesive's Product Data Sheet.
  7. Read the adhesive's Material Safety Data Sheet (MSDS) prior to using the adhesive.
- E. Seaming:
1. Weld overlapping sheets together using hot air. Minimum weld width is 1-1/2 inches.
  2. Check field welded seams for continuity and integrity and repair all imperfections by the end of each work day.
- F. Membrane Termination/Securement: All membrane terminations shall be completed in accordance with the membrane manufacturer's requirements.
1. Provide securement at all membrane terminations at the perimeter of each roof level, roof section, curb flashing, skylight, expansion joint, interior wall, penthouse, and other similar condition.
  2. Provide securement at any angle change where the slope or combined slopes exceeds two inches in one horizontal foot.
- G. Flashings: Complete all flashings and terminations as indicated on the drawings and in accordance with the membrane manufacturer's requirements.
1. Provide securement at all membrane terminations at the perimeter of each roof level, roof section, curb flashing, skylight, expansion joint, interior wall, penthouse, and other similar condition.
    - a. Do not apply flashing over existing thru-wall flashings or weep holes.
    - b. Secure flashing on a vertical surface before the seam between the flashing and the main roof sheet is completed.
    - c. Extend flashing membrane a minimum of 8 inches onto the main roof sheet beyond the mechanical securement.
    - d. Use care to ensure that the flashing does not bridge locations where there is a change in direction (e.g. where the parapet meets the roof deck).
  2. Penetrations:
    - a. Flash all pipes, supports, soil stacks, cold vents, and other penetrations passing through the roofing membrane as indicated on the Drawings and in accordance with the membrane manufacturer's requirements.
    - b. Utilize custom prefabricated flashings supplied by the membrane manufacturer.
    - c. Existing Flashings: Remove when necessary to allow new flashing to terminate directly to the penetration.
  3. Pipe Clusters and Unusual Shapes: (Consult with Architect first)

- a. Clusters of pipes or other penetrations which cannot be sealed with prefabricated membrane flashings shall be sealed by surrounding them with a prefabricated vinyl-coated metal pitch pan and sealant supplied by the membrane manufacturer.
  - b. Vinyl-coated metal pitch pans shall be installed, flashed and filled with sealant in accordance with the membrane manufacturer's requirements.
  - c. Pitch pans shall not be used where prefabricated, or field fabricated flashings are possible.
- H. Roof Drains (if required):
1. Coordinate installation of roof drains and vents specified in Section 15146 - Plumbing Specialties, or as detailed on drawings.
  2. Remove existing flashing and asphalt at existing drains in preparation for sealant and membrane.
  3. Provide a smooth clean surface on the mating surface between the clamping ring and the drain base.
- I. Edge Details:
1. Provide edge details as indicated on the Drawings. Install in accordance with the membrane manufacturer's requirements.
  2. Join individual sections in accordance with the membrane manufacturer's requirements.
  3. Coordinate installation of metal flashing and counter flashing specified in Section 07620.
  4. Manufactured Roof Specialties: Coordinate installation of copings, counter flashing systems, gutters, downspouts, and roof expansion assemblies specified in Section 07710.
- J. Walkways:
1. Install walkways in accordance with the membrane manufacturer's requirements.
  2. Provide walkways where indicated on the Drawings.
  3. Install walkway pads at roof hatches, access doors, rooftop ladders and all other traffic concentration points regardless of traffic frequency. Provided in areas receiving regular traffic to service rooftop units or where a passageway over the surface is required.
  4. Do not install walkways over flashings or field seams until manufacturer's warranty inspection has been completed.
- K. Water cut-offs:
1. Provide water cut-offs on a daily basis at the completion of work and at the onset of inclement weather.
  2. Provide water cut-offs to ensure that water does not flow beneath the completed sections of the new roofing system.
  3. Remove water cut-offs prior to the resumption of work.
  4. The integrity of the water cut-off is the sole responsibility of the roofing contractor.
  5. Any membrane contaminated by the cut-off material shall be cleaned or removed.

### 3.04 FIELD QUALITY CONTROL

- A. The membrane manufacturer's representative shall provide a comprehensive final inspection after completion of the roof system. All application errors shall be addressed and final punch list completed.

### 3.05 PROTECTION

- A. Protect installed roofing products from construction operations until completion of project.
- B. Where traffic is anticipated over completed roofing membrane, protect from damage using durable materials that are compatible with membrane.
- C. Repair or replace damaged products after work is completed.

### 3.06 CLEAN-UP:

- A. Upon completion of the membrane installation, the contractor shall remove all foreign matter, rubbish and scrap material from the roof. The membrane surface shall be cleaned using cleaners recommended by the membrane manufacturer.

### 3.07 INSPECTION & WARRANTY:

- A. Inspection: The roof system manufacturer's Quality Assurance Technician, architect and roofing contractor shall conduct all required inspections. Submit all required drawings, details, and completed questionnaires to the roofing manufacturer before obtaining the specified warranty. After an authorized Quality Assurance Technician has inspected the roof for determining acceptability for warranty issuance, any deficiencies on the final inspection report shall be corrected by the contractor/applicator and made ready for re-inspection within five (5) working days.
- B. Warranty: Upon receipt of required materials, certifying inspection, and acceptance of the roofing system by the roofing system manufacturer, the warranty shall be duly executed and issued to the Owner.

### 3.08 REPAIRS:

- A. Future repairs or additions to the roofing system shall be made using the heat welding process. Adhesive bonded or butyl tape repairs shall not be allowed for the life of the roof. Provide repair procedures to the Owner and/or Owner's representative.

### 3.09 CONSTRUCTION DAMAGE:

- A. Upon completion of work, repair or replace as required, all building materials damaged because of the roofing operations. Match existing materials as close as possible. Owner and/or Owner's representative will be involved in the selection of matching materials.

**END OF SECTION 07531**

## SECTION 07620 - SHEET METAL FLASHING AND TRIM

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section Includes:
  - 1. Formed low-slope roof sheet metal fabrications.
  - 2. Formed roof-drainage sheet metal fabrications.

#### 1.02 PREINSTALLATION MEETINGS

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

#### 1.03 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For sheet metal flashing and trim.
  - 1. Include plans, elevations, sections, and attachment details.
  - 2. Distinguish between shop- and field-assembled work.
  - 3. Include identification of finish for each item.
  - 4. Include pattern of seams and details of termination points, expansion joints and expansion-joint covers, direction of expansion, roof-penetration flashing, and connections to adjoining work.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Product certificates.
- E. Sample warranty.

#### 1.04 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Mockups: Build mockups to verify selections made under Sample submittals to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
  - 1. Build mockup of typical roof gutter, including fascia trim, approximately 12" long.

#### 1.05 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Finish Warranty Period: Minimum 20 years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.01 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

## 2.02 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
  - 1. As-Milled Finish: Mill.
  - 2. Clear Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
  - 3. Color Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
    - a. Color: If applicable, as selected by Architect from standard anodic colors.
  - 4. Exposed Coil-Coated Finish:
    - a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  - 5. Color: As selected by Architect from manufacturer's full range.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead soft, fully annealed; 2D (dull, cold rolled) finish.
- D. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40; prepainted by coil-coating process to comply with ASTM A 755/A 755M.
  - 1. Exposed Coil-Coated Finish:
    - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions. Equal to KYNAR 500.
  - 2. Color: As selected by Architect from manufacturer's full range. Note: Use the same product and finish as supplied by the manufacturer of adjacent metal panels.

## 2.03 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Carlisle Coatings & Waterproofing Inc; CCW WIP 300HT.
    - b. Grace Construction Products; W.R. Grace & Co. -- Conn.; Grace Ice and Water Shield HT.
    - c. Owens Corning; WeatherLock Metal High Temperature Underlayment.
  - 2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
  - 3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.
- B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

## 2.04 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
  - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
    - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
    - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
  - 2. Fasteners for Zinc-Coated (Galvanized) and/or Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
- C. Solder:
  - 1. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead with maximum lead content of 0.2 percent.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape one (1) inch wide and 1/8 inch thick.
- E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

## 2.05 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
  - 1. Obtain field measurements for accurate fit before shop fabrication.
  - 2. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
  - 3. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
  - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
  - 2. Use lapped expansion joints only where indicated on Drawings.
- C. Sealant Joints: Where movable, non-expansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- E. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.
- F. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.
- G. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.



## 2.06 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch-long sections. Furnish flat-stock gutter brackets and gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.
- B. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.
  - 1. Hanger Style: As indicated on drawings.
  - 2. Fabricate from the following materials:
    - a. Galvanized Steel: 0.022 inch thick.
    - b. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

## 2.07 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof Edge Flashing Fascia Cap: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long sections. Furnish with 6-inch-wide, joint cover plates.
  - 1. Fabricate from the Following Materials:
    - a. Galvanized Steel: 0.028 inch thick.
    - b. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.
- B. Base Flashing: Fabricate from the following materials:
  - 1. Galvanized Steel: 0.028 inch thick.
  - 2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.
- C. Counterflashing: Fabricate from the following materials:
  - 1. Galvanized Steel: 0.022 inch thick.
  - 2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.
- D. Roof-Penetration Flashing: Fabricate from the following materials:
  - 1. Galvanized Steel: 0.028 inch thick.
  - 2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

## 2.08 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high, end dams. Fabricate from the following materials:
  - 1. Galvanized Steel: 0.022 inch thick.
  - 2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

## PART 3 - EXECUTION

### 3.01 UNDERLAYMENT INSTALLATION

- A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.
- B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, according to manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.
- C. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing

underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.

### 3.02 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
  - 1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
  - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
  - 3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
  - 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
  - 5. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
  - 1. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
  - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
  - 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction. Prepare joints and apply sealants to comply with requirements in Section 07920 "Joint Sealants."
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.
  - 1. Do not solder metallic-coated steel and aluminum sheet.
  - 2. Do not use torches for soldering.
  - 3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
  - 4. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
  - 5. Copper Soldering: Tin edges of uncoated sheets, using solder for copper.

### 3.03 ROOF-DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

- B. Hanging Gutters: Join sections with joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.
  - 1. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.
- C. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c.

### 3.04 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate.
- C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches.
- E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

### 3.05 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

### 3.06 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

END OF SECTION 07620

## SECTION 07920 – JOINT SEALANTS

### PART 1 – GENERAL

#### 1.01 SUMMARY

- A. Section Includes:
1. Silicone joint sealants.
  2. Nonstaining silicone joint sealants.
  3. Urethane joint sealants.
  4. Mildew-resistant joint sealants.
  5. Latex joint sealants

#### 1.02 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product, along with test reports.  
B. Samples: For each kind and color of joint sealant required.

#### 1.03 WARRANTY

- A. Warrant the work specified herein for two years against becoming unserviceable or causing an objectionable appearance resulting from either defective or non-conforming materials or workmanship.
1. Warranty Period: Two years from date of Substantial Completion

#### 1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Installer shall be experienced in building sealant installation whose work has resulted in a record of successful performance.  
B. Source Limitations: If at all possible, obtain each type of building sealant through one source from a single manufacturer.

### PART 2 – PRODUCTS

#### 2.01 JOINT SEALANTS, GENERAL

- A. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

#### 2.02 SILICONE JOINT SEALANTS

- A. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Dow Corning Corporation; DOW CORNING® 786 SILICONE SEALANT -.
    - b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS1700 Sanitary.
    - c. Tremco Incorporated; Tremsil 200.

- B. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Dow Corning Corporation; DOW CORNING® 758 SILICONE WEATHER BARRIER SEALANT.
    - b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS2350.
    - c. Sherwin-Williams Company (The); Silicone Rubber All Purpose Sealant

### 2.03 URETHANE JOINT SEALANTS

- A. Urethane, M, NS, 25, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 25, Use NT.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. BASF Corporation; Construction Systems; MasterSeal NP 2 (Pre-2014: Sonolastic NP2).
    - b. Sherwin Williams Company (The); Stampede-2NS.

### 2.04 ACRYLIC LATEX MILDEW RESISTANT JOINT SEALANTS

- A. Acrylic Latex: Acrylic late or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Pecora Corporation; AC-20.
    - b. Sherwin-Williams Company (The); 950A Siliconized Acrylic Latex Caulk, White.
    - c. Tremco Incorporated; Tremflex 834.

### 2.05 JOINT-SEALANT BACKING

- A. Cylindrical Sealant Backings: ASTM C 1330, [Type C (closed-cell material with a surface skin)] [Type O (open-cell material)] [Type B (bicellular material with a surface skin)] [or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated], and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. BASF Corporation; Construction Systems; MasterSeal 920 & 921 (Pre-2014: Sonolastic Backer Rod).
    - b. Construction Foam Products; a division of Nomaco, Inc.; SOF Bi-Cellular, HBR Closed Cell, OC Foam Open Cell as required by condition.
- B. Bond-breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

### 2.06 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.

- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

### **PART 3 – EXECUTION**

#### **3.01 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 laitance and form-release agents from concrete.
  - 2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces.

#### **3.02 INSTALLATION OF JOINT SEALANTS**

- A. General: Comply with ASTM C 1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- D. 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 all recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - 1. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

#### **3.03 CLEANING**

- A. Clean adjacent surfaces of sealant as work progresses, using solvent or cleaning agents recommended by manufacturer. Avoid staining sealant or adjacent surfaces. Leave all finished work in a neat, clean condition.

**END OF SECTION 07920**

## 08110 STEEL DOORS AND FRAMES

### PART 1 GENERAL

#### 1.01 WORK INCLUDED:

- A. Comply with requirements of the Contract Documents and all applicable codes and regulations to provide steel doors and frames and related accessories, in the types and arrangements shown on the Drawings, as specified herein and as needed for a complete and proper installation.

#### 1.02 RELATED WORK:

- A. Comply with the relative requirements of other Divisions, Sections, the General and Supplementary Conditions and the Drawings of the entire Contract Documents.
- B. The breakdown of this project manual into Divisions and Sections shall not define any limit of work.

#### 1.03 QUALITY ASSURANCE:

- A. Comply with requirements and recommendations of referenced standards and with all applicable codes and regulations, except where Contract Documents are more stringent.

#### 1.04 REFERENCES:

- A. "Hollow Metal Technical Design Manual", National Association of Architectural Metal Manufacturers. (NAAMM)
- B. "Standard Steel Doors and Frames", Steel Door Institute. (SDI)
- C. "Fire Test of Door Assemblies, UL 10A", Underwriters Laboratories, Inc. (UL)
- D. "Fire Doors and Windows", Pamphlet 80, National Fire Prevention Association. (NFPA)

#### 1.05 SHOP DRAWING SUBMITTALS:

- A. Submit in accordance with Section 01300.
- B. Show each type of door and frame, frame conditions, and complete anchorage details, supplemented by suitable schedules individually noting each door and frame with applicable data for each.
- C. Indicate reinforcements and all accessories, including gages, profiles, attachments.
- D. Detail connections of hollow metal work to work of other trades.

#### 1.06 HANDLING:

- A. Follow special storage and handling requirements of manufacturer.
- B. Provide packaging such as cardboard or other containers, separators, banding, spreaders, and paper wrappings to protect hollow metal items.

**PART 2 PRODUCTS****2.01 ACCEPTABLE MANUFACTURERS:**

- A. American Metal, Amertex, Amweld, Builders Manufacturing Co., Bymoco, Ceco, Curries, Firedoor Corp., Tex-Steel Corp., Mesker Ind. Co., Phillipp, Williamsburg.

**2.02 FRAME MATERIALS AND CONSTRUCTION:**

- A. General: Products fabricated from hot rolled prime quality carbon steel.
- B. Design: Combination buck, frame and trim type, in configuration as noted by Drawings.
- C. Gauge: Exterior and interior door frames and sidelights, 16 gauge, unless otherwise indicated on schedule. Exterior window frames, 18 gauge, unless otherwise indicated on Drawings.
- D. Reinforcement: 3/16" thick, size as required. Provide for all concealed or surface applied hardware.
- E. Anchors at Masonry: 18 gauge corrugated T anchors, minimum 3 each to 6'-8" high jamb, minimum 4 each to 8'-0" high jamb, minimum 5 each 11'-4" high jamb. Provide special shaped T anchors as detailed.
- F. Anchors at Wood Studs: 18 gage stud anchors, as detailed.
- G. Floor Anchors All Jamb: 14 gage clips welded to frames and bolted to floor with two (2) 2 1/4" x 1 1/2" expansion bolts each clip.
- H. Dust Covers: Provide for all cut-outs.
- I. Label: Provide label for openings where required and/or scheduled.
- J. Fixed Panels: Provide as required and/or scheduled, same construction as door.
- K. Finish, Exterior Door and Window Frames: Fabricate from galvanized steel. Prime welds with Galvacron. Prime as described under interior frames.
- L. Finish, Interior Frames: Bonderize with primer applied and baked on over steel which has been treated for rust resistance and paint adherence by one of the Bonderite or Parkerizing systems.

**PART 3 EXECUTION****3.01 FABRICATION:**

- A. Prepare frames to receive hardware.
- B. Provide reinforcements for both concealed and surface applied hardware. Drill and tap mortise reinforcements at factory, using templates furnished by Hardware Supplier.
- C. Punch frames to receive rubber door silencers furnished by Hardware Supplier, 3 per strike jamb.
- D. Frames shall be leveled, and all joints welded and ground smooth.

**3.02 DOOR MATERIALS AND CONSTRUCTION:**

- A. Design: Fully flush with openings as scheduled. Provide matching transoms where scheduled.



- B. Construction: Doors fabricated from 18 gage, unless specifically noted otherwise, galvanized and bonderized steel with flush edges, tops and bottoms vertically reinforced with galvanized steel channels welded to face sheets. Joints at edges shall be sealed, ground smooth and filled. Interior of doors shall be insulated with an Underwriter's approved sound deadening and heat insulating material. Proper provision shall be made for all hardware with drilling and tapping furnished for all mortised and template items. Reinforce for butts, lock faces, lock escutcheon and other surface applied hardware. Provide labeled doors for openings where required and/or scheduled.
- C. Finish: Same as specified for hollow metal frames.
- D. Hardware Templates: Furnished by Hardware Supplier for hardware preparation.
- E. Security Doors: Provide 14 ga. frames and 14 ga. doors where called for on documents.

### 3.03 INSTALLATION OF DOORS AND FRAMES:

- A. General: Exercise care in setting of frames to maintain scheduled dimensions, hold head level and maintain jambs plumb and square. Secure anchorages and connections to adjacent construction. Wherever possible, leave frame spreader bars intact until frames are set perfectly square and plumb, and anchors are securely attached. Allow for expansion movement as required.
- B. Labeled Frames: Installation of labeled frames shall conform to referenced NFPA requirements.
- C. Prime Coat Touch-up: Immediately after erection, areas where prime coat has been damaged or rust appears, shall be sanded smooth and touched up with primer as applied at shop.

### 3.04 PROTECTION:

- A. Protect frames and doors from damage from other work. **Dented doors or frames shall be removed and replaced, or factory repaired.**

**END SECTION 08110**

## 08200 FLUSH WOOD DOORS

### PART 1 - GENERAL

#### 1.01 WORK INCLUDED:

- A. Comply with requirements of the Contract Documents and all applicable codes and regulations to provide flush wood doors and frames and related accessories, in the types and arrangements shown on the Drawings, as specified herein and as needed for a complete and proper installation.

#### 1.02 RELATED WORK:

- A. Comply with the relative requirements of other Divisions, Sections, the General and Supplementary Conditions and the Drawings of the entire Contract Documents. The breakdown of this project manual into Divisions and Sections shall not define any limit of work.

#### 1.03 QUALITY ASSURANCE:

- A. Comply with requirements and recommendations of referenced standards and with all applicable codes and regulations, except where Contract Documents are more stringent.

#### 1.04 REFERENCES:

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer=s instructions.
- B. Quality Standards: NWWDA I.S. 1A, and AWI Architectural Quality Standards.
- C. Quality Standards: NWWDA I.S. 1A, and WIC Manual of Millwork.
- D. Fire Rated Wood Doors: Meeting ASTM E 152 requirements.

#### 1.05 SUBMITTALS:

- A. Submit samples, shop drawings, product data and warranty for approval.

#### 1.06 HANDLING:

- A. Follow special storage and handling requirements of manufacturer. Provide packaging such as cardboard or other containers, separators, banding, spreaders, and paper wrappings to protect wood doors.

### PART 2 - PRODUCTS

#### 2.01 ARCHITECTURAL FLUSH WOOD DOORS:

- A. Manufacturers: IPIK, VT Industries, Chappell, Oskosh, or approved equal.
- B. Faces: Shall be paint grade birch veneer.

- C. AWI Grade: Custom Grade.
- D. Construction: Particle board core with matching factory finished hardwood vertical edges in accordance with AWI 1300-G-3, construction. Doors shall be factory machined for hardware. Provide labeled doors and transom panels as scheduled in accordance with AWI 1300-G-4 Specifications.
- E. Metal Frames for Door Lights in Labeled Doors: Provide UL approved primed steel glass frames for door lights in all labeled doors as scheduled. Frames shall be equal to Anemostat Products #FGS-75, UL or Warnock-Hersey International listed, primed steel glass frames or an approved equivalent. Glass is specified in Section 08800.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION:**

- A. All items shall be neatly, securely, and completely installed in a workmanlike manner by the Contractor for proper operation with frames and hardware.
- B. Install doors plumb, with not more than 1/8" clearance at top and sides, 1/4" at bottom. Comply with NFPA 80 for rated assemblies.
- C. At the end of installation, make adjustments as necessary, clean and protect doors.

**END OF SECTION 08200**

## 08361 – INSULATED SECTIONAL GARAGE DOORS

### PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Commercial sectional doors.

#### 1.02 RELATED SECTIONS

- A. Section 05 50 00 - Metal Fabrications: Miscellaneous for steel supports.
- B. Section 06100 - Rough Carpentry. Door opening jamb and head members
- C. Section 08710 - Door Hardware: Hardware, locks, access panels.
- D. Section 09900 - Painting: Field painting.
- E. Section 26 05 00 - Common Work Results for Electrical.

#### 1.03 REFERENCES

- A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- C. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- D. ASTM A 924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- E. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems Current Edition, Including All Revisions.
- F. ANSI/DASMA 108 - Standard Method for Testing Sectional Garage Doors, Rolling Doors, and Flexible Doors: Determination of Structural Performance Under Uniform Static Air Pressure Difference
- G. ANSI/DASMA 102 - Specifications for Sectional Overhead-Type Doors
- H. ANSI/DASMA 115 - Standard Method for Testing Sectional Doors, Rolling Doors, and Flexible Doors: Determination of Structural Performance Under Missile Impact and Cyclic Wind Pressure

#### 1.04 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Shop Drawings:
  - 1. Provide drawings indicating track details, head and jamb conditions, spring shafts, anchorage, accessories, finish colors, patterns and textures, operator mounts and other related information.
  - 2. Regulatory Requirements and Approvals: Provide shop drawings in compliance with local Authority having Jurisdiction (AHJ).
- D. Certifications:

1. Submit manufacturer's certificate that products meet or exceed specified requirements.
- E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- F. Verification Samples: For each finish product specified, two samples, minimum size 6 inches square, representing actual product, color, and patterns.

#### 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Utilize an authorized installer of door manufacturer who has demonstrated experience on projects of similar size and complexity.
- B. Manufacturer Qualifications: Company with a minimum of five years of experience in producing the specified type of doors.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.

#### 1.07 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.
  1. Do not leave building unsecure at the end of a work day. Always leave building secure and locked.

#### 1.08 WARRANTY

- A. Provide manufacturer's standard warranty against defects in material and workmanship, as further described with each model in Part 2 of this Section.

### **PART 2 - PRODUCTS**

#### 2.01 MANUFACTURERS

- A. Acceptable Manufacturer: Raynor, which is located at: 1101 East River Rd. P. O. Box 448; Dixon, IL 61021-0448; Toll Free Tel: 800-4-RAYNOR; Tel: 815-288-1431; Fax: 888-598-4790; Email: architectsupport@raynor.com; Web: www.raynor.com
- B. Substitutions: Overhead Door, Dalton, or approved equal.
- C. Requests for substitutions will be considered in accordance with the provisions of Section 01600.

#### 2.02 SECTIONAL THERMAL SANDWICH DOORS

- A. EnergyCore as manufactured by Raynor Garage Doors:
  1. Doors:
    - a. Operation:
      - 1) Provide doors designed for electric motor operation.
    - b. Jamb Construction:
      - 1) Steel jambs – Existing

- c. Structural Performance Requirements:
    - 1) Wind Loads: 10.0 psf design load/ 15.0 psf test load standard
2. Door Sections:
  - a. EC200:
    - 1) Sections shall be pressure bonded to a 1-7/8 inches thick expanded polystyrene core with interior and exterior skins separated by a continuous thermal break. Hinge reinforcement plates shall be 16 gauge edge plates and 16 gauge center plates, located within section interior at every hinge location. End stiles to be 18 gauge galvanized steel.
    - 2) Material: Steel sandwich construction, 2 inches thick, roll formed from draw quality, hot-dipped galvanized (G40 exterior) steel complying with ASTM A 653. Exterior and interior skin to be constructed of 26 gauge steel embossed gunite texture.
    - 3) Finish: Exterior skin to have two coats of paint, one primer coat and one finish coat.
      - a) Color: White, Brown, Black, Shale, Grey, and Taupe.
    - 4) Insulation: Expanded polystyrene with R-value of 10.0.
  - b. Seals: Bottom of door to have flexible U-shaped vinyl seal retained in aluminum rail.
    - 1) Provide blade seal on top section to prevent airflow above header.
    - 2) Bottom of door to have flexible U-shaped vinyl seal retained in aluminum rail.
  - c. Trussing: Doors designed to withstand specified wind load. Deflection of door in horizontal position to be maximum of 1/120th of door width.
3. Windows: Locations to comply with door elevation drawings.
  - a. Window in Rectangular Two-Piece Black Frame:
    - 1) Size: 24 inches by 8 inches).
      - a) Insulated, two panes of 1/8 inch thick tempered glass.
4. Track:
  - a. Existing
    - 1) Jamb Type: Steel, Existing.
  - b. Track Size: 3", verify on job
  - c. Finish:
    - 2) Galvanized.
5. Counterbalance:
  - a. Counterbalance System: Provided with aircraft-type, galvanized steel lifting cables with minimum safety factor of 5. Torsion Springs consisting of heavy-duty oil-tempered wire torsion springs on a continuous ball-bearing cross-header shaft.
    - 1) Spring Cycle Requirements: High cycle: 20,000 cycles.
5. Hardware:
  - a. Hinges and Brackets: Fabricated from galvanized steel.
  - b. Track Rollers: 3 inches diameter consistent with track size, with hardened steel ball bearings.
  - c. Perimeter Seal: Provide complete weather stripping system to reduce air infiltration. Weather stripping shall be replaceable.
    - 1) For bracket mounted doors provide climate seal or vinyl seal with aluminum retainer.
    - 2) For angle mounted doors provide angle clip-on seal.
6. EnergyCore Limited Warranty: Manufacturer warrants the door sections against defects in material and workmanship, and deterioration due to rust-through for

ten (10) years from date of delivery to the original purchaser. Manufacturer also warrants the door sections against delamination of the insulation from the steel skins for ten (10) years from date of delivery to the original purchaser. Window components are warranted against defects in material and workmanship for one (1) year from date of delivery to the original purchaser. Manufacturer warrants all hardware and spring components against defects in material and workmanship for one (1) year (or cycle life of the springs) from date of delivery to the original purchaser. Additional Limited Warranty requirements in accordance with manufacturer's full standard limited warranty documentation.

## 2.03 ELECTRIC OPERATORS

- A. Existing, to be re-used

## **PART 3 - EXECUTION**

### 3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared. Verify that site conditions are acceptable for installation of doors, operators, controls, and accessories. Ensure that openings are square, flush, and plumb.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### 3.03 INSTALLATION

- A. General: Install door, track and operating equipment complete with all necessary accessories and hardware according to shop drawings, manufacturer's instructions.
- B. Lubricate bearings and sliding parts, and adjust doors for proper operation, balance, clearance, and similar requirements.

### 3.04 PROTECTION

- A. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove and legally dispose of construction debris from project site.
- B. Remove temporary coverings and protection of adjacent work areas. Repair or replace installed products damaged prior to or during installation.
- C. Lubricate bearings and sliding parts, assure weather tight fit around door perimeter and adjust doors for proper operation, balance, clearance, and similar requirements. Protect installed products until completion of project.
- D. Touch-up, repair or replace damaged products before Substantial Completion.

**END OF SECTION 08361**

## SECTION 08410 - ALUMINUM ENTRANCES AND STOREFRONT WINDOWS

### PART 1 - GENERAL

#### 1.01 WORK INCLUDED:

- A. Comply with requirements of the Contract Documents and all applicable codes and regulations to provide aluminum entrances and storefronts and related accessories, in the types and arrangements shown on the Drawings, as specified herein and as needed for a complete and proper installation.

#### 1.02 RELATED WORK:

- A. Comply with the relative requirements of other Divisions, Sections, the General and Supplementary Conditions and the Drawings of the entire Contract Documents. The breakdown of this project manual into Divisions and Sections shall not define any limit of work.

#### 1.03 QUALITY ASSURANCE:

- A. General: Comply with requirements and recommendations of referenced standards and with all applicable codes and regulations, except where Contract Documents are more stringent.
- B. Applicator: A specialty subcontractor, capable of showing successful installations similar to work required for this project, shall perform the work of this Section.
- C. Curtainwall system and sun shading devices, "Aluminum Sunshade Devices" to be manufactured by single manufacturer.
- D. Comply with IBC Section 1609, for wind speed and importance factor.

#### 1.04 REFERENCES:

- A. "Metal Curtain Wall, Window, Storefront, and Entrance Guide Specifications Manual", Architectural Aluminum Manufacturers Association.

#### 1.05 SUBMITTALS:

- A. Shop Drawings: Submit in accordance with Section 01300. Show all fabrication and installation details, including elevations, detail sections, anchorages, reinforcement, expansion provisions, and glazing details. Detail connections of aluminum frame work to work of other trades. Provide lists of hardware specified with product data on each.
- B. Product Data: Submit in accordance with Section 01300. Submit manufacturer's specifications, standard details, and installation recommendations for components required for project, including data that products have been tested and comply with performance requirements.
- C. Provide Engineer Data: Submit signed engineer calculations that aluminum curtain wall and sunshade devices comply with Chapter 6 of ASCE 7.05, per IBC 1609.11 wind speed of 90 m.p.h. with wind importance factor of 1.15.



**1.06 DELIVERY, STORAGE AND HANDLING:**

- A. Follow special storage and handling requirements of manufacturer.

**PART 2 - PRODUCTS****2.01 OTHER ACCEPTABLE MANUFACTURERS:**

- A. Products of Kawneer Company, Inc. are specified and detailed, however, subject to the conditions of 01300 for equal products:
  - 1. Other suitable manufacturers are Oldcastle, and United States Aluminum.

**2.02 ALUMINUM DOORS & FRAMES:**

- A. All frames, windows and doors shall be center glazed design and finish as indicated on drawings; Kawneer Trifab VG 451T Storefront Window System (Center Glazed), miscellaneous shapes and specialty products:
  - 1. Aluminum Members: Alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish; ASTM B 221 for extrusions, ASTM B 209 for sheet/plate.
  - 2. Fasteners: Aluminum, non-magnetic stainless steel, or other materials warranted by manufacturer to be non-corrosive and compatible with aluminum components.
    - a. Do not use exposed fasteners except where unavoidable for application of hardware. Match finish of adjoining metal.
    - b. Provide Phillips flat-head machine screws for exposed fasteners.
- B. Concealed Flashing: Dead-soft stainless steel, 26 gauge minimum, or extruded aluminum, 0.040" minimum of an alloy and type selected by manufacturer for compatibility with other components.
- C. Brackets, Reinforcements and Internal Vertical reinforcing steel or channels: Manufacturer's high-strength aluminum units where feasible; otherwise, provide non-magnetic stainless steel or hot-dip galvanized steel complying with ASTM A 386 as required to obtain all wind, live and dead loads.
- D. Masonry Inserts: Cast-iron, malleable iron, or hot-dip galvanized steel complying with ASTM A 386.
- E. Bituminous Coatings: Cold-applied asphalt mastic complying with SSPC-PS 12, compounded for 30-mil thickness per coat.
- F. Compression Weatherstripping: Manufacturer's standard replaceable stripping of either molded neoprene gaskets complying with ASTM D 2000 or molded PVC gaskets complying with ASTM D 2287.
- G. Sliding Weatherstripping: Manufacturer's standard replaceable stripping of wool, polypropylene, or nylon woven pile, with nylon fabric or aluminum strip backing, complying with AAMA 701.2.
- H. Glass and Glazing Materials: Provide insulated glass and glazing materials which comply with requirements of Section 08800 Glazing of these specifications.
- I. Sealants: As specified in Section 07900 - Sealants.
- J. Aluminum Finishes: Kynar 500 or equal.

**2.03 HARDWARE & ACCESSORIES:**

- A. Emergency Egress Windows where called for: Provide cont. hinge top hung project out unit with single lever type release (lock) which meets ADA Guidelines.

#### 2.04 FABRICATION (GENERAL):

- A. Sizes and Profiles: Required sizes for door and frame units, including profile requirements, are indicated on drawings. Any variable dimensions are indicated, together with maximum and minimum dimensions required to achieve design requirements and coordination with other work.
- B. Prefabrication: To greatest extent possible, complete fabrication, assembly, finishing, hardware application, and other work before shipment to project site. Disassemble components only as necessary for shipment and installation.
  - 1. Pre-glaze door and frame units to greatest extent possible, in coordination with installation and hardware requirements.
  - 2. Do not drill and tap for surface-mounted hardware items until time of installation at project site.
  - 3. Perform fabrication operations, including cutting, fitting, forming, drilling, and grinding of metal work in manner which prevents damage to exposed finish surfaces. For hardware, perform these operations prior to application of finishes.
- C. Welding: Comply with AWS recommendations to avoid discoloration; grind exposed welds smooth and restore mechanical finish.
- D. Reinforcing: Install reinforcing as necessary for performance requirements; separate dissimilar metals with bituminous paint or other separator which will prevent corrosion.
- E. Continuity: Maintain accurate relation of planes and angles, with hairline fit of contacting members.
- F. Fasteners: Conceal fasteners wherever possible.
- G. Weatherstripping: For exterior doors, provide compression weatherstripping against fixed stops; at other edges, provide sliding weatherstripping retained in adjustable strip mortised into door edge.
  - 1. Provide EPDM/vinyl blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.
  - 2. At interior doors and other locations without weatherstripping, provide neoprene silencers on stops to prevent metal-to-metal contact.

### **PART 3 - EXECUTION**

#### 3.01 PREPARATION:

- A. Field Measurement: Wherever possible, take field measurements prior to preparation of shop drawings and fabrication, to ensure proper fitting of work. However, proceed with fabrication and coordinate installation tolerances as necessary when field measurements might delay work.

#### 3.02 INSTALLATION:

- A. Comply with manufacturer's instructions and recommendations for installation of aluminum entrances and storefronts.
- B. Set units plumb, level, and true to line, without warp or rack of framing members or

- doors. Anchor securely in place, separating aluminum, and other corrodible metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials.
- C. Drill and tap frames and apply surface-mounted hardware items, complying with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.
  - D. Set sill members and other members in bed of sealant as indicated, or with joint fillers or gaskets as indicated to provide weathertight construction. Comply with requirements of Division 7 for sealants, fillers, and gaskets.
  - E. Refer to Section 08800 Glazing for installation of glass and other panels indicated to be glazed into doors and framing, and not pre-glazed by manufacturer.
- 3.03 PROTECTION:
- A. Protect frames from damage from other work.
- 3.04 ADJUSTMENT:
- A. Adjust operating hardware to function properly, without binding, and to provide tight fit at contact points and weatherstripping.
- 3.05 CLEANING:
- A. Clean completed system, inside and out, promptly after erection and installation of glass and sealants. Remove excess glazing and sealant compounds, dirt, and other substances from aluminum surfaces.

**END OF SECTION 08410**

## SECTION 08710 - DOOR HARDWARE

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Work Included: Comply with requirements of the Contract Documents and all applicable codes and regulations to provide finish hardware and related accessories, in the types and arrangements shown on the Drawings, as specified herein and as complete and proper installation.
- B. Related Work: Comply with the relative requirements of other Divisions, Sections, the General and Supplementary Conditions and the Drawings of the entire Contract Documents. The breakdown of this project manual into Divisions and Sections shall not define any limit of work.
- C. Quality Assurance:
  - 1. General: Comply with requirements and recommendations of referenced standards and with all applicable codes and regulations, except where Contract Documents are more stringent.
  - 2. Contractor: Contractor shall select only a supplier who has in his employ qualified Architectural Hardware Consultants, who shall manage and coordinate the complete hardware contract and shall be located within 150 miles of the project. This consultant shall also be available to visit the job in order to solve or correct any conditions affecting proper hardware installation or adjustments as required. Hardware Supplier shall accumulate and hold hardware to ship in one shipment when requested by Contractor. Direct shipments from factories to job site will not be permitted.
- D. Reference: "Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People", A 117.1, American National Standard Institute.
- E. Hardware Schedule Submittal: Submit in accordance with Section 01300. Submit hardware schedule showing the quantities, types, catalog numbers and locations of the various items of finish hardware required.
- F. Delivery, Storage and Handling: Deliver hardware to the project site in the manufacturer's original packages. Neatly wrap and individually pack each article of hardware in a substantial carton or other container, properly marked or labeled so as to be readily identifiable with the schedule. Furnish a secure area for delivery by hardware supplier of Finish Hardware and storage of same.

### PART 2 - PRODUCTS

#### 2.01 PRODUCT REQUIREMENTS

- A. General Requirements: While the hardware schedule is intended to cover all doors and other movable parts of the building and establish a type and standard of quality, examine Drawings and Specifications and furnish proper hardware for all openings whether listed or not. If there are any omissions in hardware groups, call them to the attention of Architect prior to bid opening for instructions; otherwise, list will be considered complete. No extras will be allowed for omissions, changes corrections necessary to facilitate proper installation.
- B. Types and Sizes: Provide hardware of the type and sizes selected.

- C. Templates: Application of hardware on metal shall be made to standard templates. Provide physical samples or templates as required for the proper manufacture and application. Frame manufacturer shall provide reinforcing for hardware.
- D. Modifications: Modifications to hardware required by reasons of construction characteristics shall provide the same operative or functional features.
- E. Keying: Hardware Consultant shall prepare key layout with Owner and Architect. Set cylinders to masterkey. Deliver all permanent keys to Owner in key cabinet showing the key set, key cut, and location. Furnish two (2) change keys per lockset and six (6) masterkeys. Provide Stanley/Best patented key system per University Standard.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
- C. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
  - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
  - 2. Custom Steel Doors and Frames: HMMA 831.
  - 3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- D. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
  - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
  - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- E. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- F. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches of door height greater than 90 inches.
- G. Lock Cylinders: Install construction cores to secure building and areas during construction period.
  - 1. Replace construction cores with permanent cores as required at job completion.
- H. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 07920 "Joint Sealants."
- I. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- J. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

- K. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- L. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
- M. Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

### 3.02 FIELD QUALITY CONTROL

- A. All hardware shall be installed by mechanics skilled in the application of institutional grade hardware. Read and understand all instruction sheets, installation details, etc. packed with hardware before attempting to install. Architectural Hardware Consultant shall be available to consult with installer and contractor.

### 3.03 DOOR HARDWARE SCHEDULE

- A. Schedule as follows on the next page(s):

**H-1**

AE1            AE2            AE3

EACH TO HAVE:

ALL HARDWARE BY ALUMINUM DOOR AND FRAME SUPPLIER.

**H-2**

1

EACH TO HAVE:

2	EA	CONT. HINGE	662HD	CLR	BES
2	EA	SURFACE BOLT	SB453-8	652	IVE
1	EA	SURFACE CLOSER	HD8000-SPAT	689	BES
1	EA	OVERHEAD STOP	900H	630	GLY
1	EA	SECURITY ASTRAGAL	1390SP	600	NGP
1	SET	SEALS	160V	AL	NGP
1	EA	THRESHOLD	896V	AL	NGP
2	EA	DOOR SHOE	35VA	AL	NGP

**H-3**

104

EACH TO HAVE:

1	EA	CONT. HINGE	662HD	CLR	BES
1	EA	CLASSROOM LOCK	93K-7-R-15D-S3	626	BES
2	EA	DEADBOLT	83T-K-STK	626	BES
1	EA	SECURITY ASTRAGAL	1390SP	600	NGP
1	EA	SURFACE CLOSER	HD8000-SPAT	689	BES
3	EA	SILENCER	SR64	GRY	IVE

**H-4**

204A            204B

EACH TO HAVE:

3	EA	HINGES	FBB179 4.5 x 4.5	652	BES
1	EA	DEADBOLT	83T-K-STK @ 204B ONLY	626	BES
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8303-8 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	HD8000-DS	689	BES
1	EA	DOME STOP	FS436	626	IVE
3	EA	SILENCERS	SR64	GRY	IVE

**H-5**

102            201A            201B

EACH TO HAVE:

3	EA	HINGE	FBB179 4.5 x 4.5	652	BES
1	EA	CLASSROOM LOCK	93K-7-R-15D-S3	626	BES
1	EA	SURFACE CLOSER	HD8000-AF80P	689	BES
1	EA	DOME STOP	FS436	626	IVE
1	SET	SEALS	5060B	BRN	NGP
3	EA	SILENCER	SR64	GRY	IVE

**H-6**

207

EACH TO HAVE:

6	EA	HINGE	FBB179 4.5 X 4.5	652	BES
2	EA	SURFACE BOLT	SB453-8	652	IVE
1	EA	CLASSROOM LOCK	93K-7-R-15D-S3	626	BES
2	EA	OVERHEAD STOP	900S	630	GLY
3	EA	SILENCER	SR64	GRY	IVE

**H-7**

206 209

EACH TO HAVE:

3	EA	HINGE	FBB179 4.5 X 4.5	652	BES
1	EA	ENTRANCE LOCK	93K-7-AB-15D-S3	626	BES
1	EA	DOME STOP	FS436	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

**H-8**

103

EACH TO HAVE:

3	EA	HINGE	FBB179 4.5 X 4.5	652	BES
1	EA	PRIVACY SET	93K-0-L-15D-S3	626	BES
1	EA	DOME STOP	FS436	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

**H-9**

203 205

EACH TO HAVE:

3	EA	HINGE	FBB179 4.5 X 4.5	652	BES
1	EA	PASSAGE SET	93K-0-N-15D-S3	626	BES
1	EA	OVERHEAD STOP	900S	630	GLY
3	EA	SILENCER	SR64	GRY	IVE

NOTES:

1. HARDWARE SUPPLIER IS TO PROVIDE PERMANENT KEYED CORES FOR ALL LOCKSETS AND CYLINDERS.
2. ADJUST HINGE SIZES AS NECESSARY AT EXISTING OPENINGS.

MANUFACTURERS USED

HINGES	BEST	BOMMER(BB5000), IVES (5BB1)
CONT. HINGES	BEST	BOMMER(FM), IVES (224HD)
LOCKSETS-	BEST	MATCH EXISTING
CLOSERS-	BEST	LCN(4040XP), SARGENT (281)
TRIM -	IVES	TRIMCO, ROCKWOOD
AUXILIARY-	GLYNN JOHNSON	ROCKWOOD, TRIMCO
SEALS/THRESHOLD-	NATIONAL GUARD	PEMKO, ZERO

**END OF SECTION 08710**



## SECTION 08800 - GLAZING

### PART 1 - GENERAL

#### 1.01 WORK INCLUDED:

- A. Comply with requirements of the Contract Documents and all applicable codes and regulations to provide glazing and related accessories, in the types and arrangements shown on the Drawings, as specified herein and as needed for a complete and proper installation.

#### 1.02 RELATED WORK:

- A. Comply with the relative requirements of other Divisions, Sections, the General and Supplementary Conditions and the Drawings of the entire Contract Documents. The breakdown of this project manual into Divisions and Sections shall not define any limit of work.

#### 1.03 QUALITY ASSURANCE:

- A. General: Comply with requirements and recommendations of referenced standards and with all applicable codes and regulations, except where Contract Documents are more stringent.
- B. Prime Glass Standard: FS DD-G-451.
- C. Heat-Treated Glass Standard: FS DD-G-1403.
- D. Safety Glass Standard: CPSC 16 CFR 1201.
- E. Erector: Normally engaged in work required with minimum 3 years' experience.

#### 1.04 REFERENCES:

- A. "Metal Curtain Wall, Window, Storefront, and Entrance Guide Specifications Manual", Architectural Aluminum Manufacturers Association.
- B. "Glazing Manual", Flat Glass Marketing Association.

#### 1.05 PRODUCT DATA SUBMITTALS:

- A. Submit in accordance with Section 01300. Submit manufacturer's product description and installation specifications.

#### 1.06 DELIVERY, STORAGE AND HANDLING:

- A. Follow special storage and handling requirements of manufacturer.

#### 1.07 SAFETY STANDARD:

- A. Manufacture of glass and glazing materials and fabrication and installation of glazing materials, shall meet the requirements of the "Safety Standard for Architectural Glazing Materials (16 CFR Part 1201)", dated January 6, 1977, effective July 6, 1977, issued by the Consumer Product Safety Commission, and any amendments thereto.

**PART 2 - PRODUCTS****2.01 OTHER ACCEPTABLE MANUFACTURERS:**

- A. Subject to the conditions of paragraph 01600.9.2, equal products of the following manufacturers are acceptable: ASG Industries, Inc., C-E Glass Division, Libbey-Owens-Ford Company, and PPG Industries, Inc.

**2.02 FLOAT/PLATE GLASS:**

- A. 1/4" thick, clear float glass of color and type indicated on drawings and/or schedules.

**2.03 TEMPERED GLASS:**

- A. 1/4" thick, prime glass of color and type indicated, which has been heat treated to strengthen glass in bending to not less than 4.5 times annealed strength.

**2.04 OPAQUE SPANDREL GLASS:**

- A. 1/4" thick, spandrel glass with opaque coating on back side of pane, as indicated on Drawings.

**2.05 SAFETY GLASS:**

- A. 1/4" thick, prime laminated safety glass, color as indicated on Drawings.

**2.06 POLISHED WIRE GLASS:**

- A. 1/4" thick, Type III, Kind A, Form 1, Quality q11, Mesh m3-square, clear wire glass, polished both faces.

**2.07 INSULATED GLASS:**

- A. Double 1/4" glass pane, hermetically sealed 1" insulated glass assembly. Provide float or tempered panes based on location of glazing with respect to openings. Color shall be SOLAR GRAY exterior pane.

**2.08 INSULATED SPANDREL PANEL:**

- A. Mapes-R Insulated Aluminum Panels, 1" overall thickness, 3/16" hardboard substrate, polystyrene core, with formed edges wrapped continuously with smooth Kynar finish aluminum.
- B. Color shall be one custom color as selected by Architect. Panel shall have an offset reveal design and shall be secured in a 1" glazing pocket within aluminum framing as specified. Product shall be manufactured by Mapes Architectural Panels, or approved equal.

**2.09 SEALANT:**

A. Refer to Section 07 90 00.

2.10 SETTING BLOCKS:

A. Hard rubber or clear softwood.

**PART 3 - EXECUTION**

3.01 INSTALLATION:

A. Comply with manufacturer's and referenced standards, instructions and recommendations for installation.

3.02 PROTECTION:

- A. Protect glass from breakage immediately upon installation, by use of crossed streamers attached to framing and held away from glass.
- B. Do not apply markers to surfaces of glass. Remove non-permanent labels and clean surfaces.
- C. Remove and replace broken, chipped, or cracked glass during construction period.

3.03 CLEANING:

A. Clean completed system, inside and out, not more than 4 days prior to scheduled Substantial Completion Certificate inspection.

**END OF SECTION 08800**

## SECTION 09290 - GYPSUM BOARD

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section Includes:
  - 1. Interior gypsum board.
  - 2. Tile Backer board.
  - 3. Texture finishes.

#### 1.02 SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each texture finish indicated on same backing indicated for Work.

### PART 2 PRODUCTS

#### 2.01 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

#### 2.02 GYPSUM BOARD, GENERAL - MANUFACTURER

- A. Basis-of-Design Product: Subject to compliance with requirements, provide National Gypsum Company; Gold Bond Brand Gypsum Board, or comparable product by one of the following:
  - 1. CertainTeed Corporation.
  - 2. Georgia-Pacific Building Products.
  - 3. Temple-Inland Building Products by Georgia-Pacific.
  - 4. United States Gypsum Company.
- B. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

#### 2.03 MOLD AND MOISTURE RESISTANT GYPSUM BOARD

- A. Basis of Design: Gold Bond® brand XP Gypsum Board
  - 1. Panel Physical Characteristics
    - a. Core: Mold and moisture resistant gypsum core
    - b. Surface paper: 100 percent recycled content moisture/mold/mildew resistant paper on front, back, and long edges
    - c. Long Edges: Tapered
    - d. Overall thickness: 1/2"
    - e. Panel complies with requirements of ASTM C 1396
    - f. Mold/Mildew Resistance: 10 when tested in accordance with ASTM D 3273

## 2.04 FIRE-RESISTANCE RATED GYPSUM BOARD WITH ENHANCED MOLD AND MILDEW RESISTANCE

- A. Basis of Design: Gold Bond® brand XP® Fire-Shield® Gypsum Board
  - 1. Type X, Panel Physical Characteristics
    - a. Core: Mold and moisture resistant, fire-resistance rated gypsum core
    - b. Surface paper: 100 percent recycled content moisture/mold/mildew resistant paper on front, back and long edges
    - c. Long Edges: Tapered
    - d. Overall thickness: 1/2"
    - e. Panel complies with Type X requirements of ASTM C 1396
    - f. Mold/Mildew Resistance: 10 when tested in accordance with ASTM D 3273
- B. Basis of Design: Gold Bond® brand XP® Fire-Shield® C Gypsum Board
  - 1. Type C, Panel Physical Characteristics
    - a. Core: Mold and moisture resistant gypsum core with enhanced fire-resistance (Type C)
    - b. Surface paper: 100 percent recycled content moisture/mold/mildew paper on front, back and long edges
    - c. Long Edges: Tapered
    - d. Overall thickness: 1/2"
    - e. Panel complies with requirements Type X of ASTM C 1396
    - f. Mold/Mildew Resistance: 10 when tested in accordance with ASTM D 3273

## 2.05 MOLD AND MILDEW RESISTANT TILE BACKER

- A. Basis of Design: Gold Bond® brand eXP® Tile Backer
  - 1. Panel Physical Characteristics
    - a. Core: Mold and moisture resistant, fire-resistant or Fire-Shield Type X, gypsum core
    - b. Thickness: 1/2 inch or 5/8-inch, Type X as indicated on Drawings
    - c. Facer: Fiberglass Mat; moisture resistant, acrylic coated water barrier on front
    - d. Long Edges: Square
    - e. Water Absorption: less than 5 percent when tested in accordance with ASTM C 473
    - f. Combustibility: Noncombustible when tested in accordance with ASTM E 136
    - g. Flame spreads/Smoke Developed: 0/0 when tested in accordance with ASTM E 84
    - h. Mold/Mildew Resistance: 10 when tested in accordance with ASTM D 3273
    - i. Panel complies with requirements of ASTM C 1178.

## 2.06 CEMENT BOARD

- A. Cement Backerboard Basis of Design: PermaBase® brand Cement Board
  - 1. Panel Physical Characteristics
    - a. Core: Cementitious, water-durable
    - b. Surface: Fiberglass mesh on front and back
    - c. Long Edges: Tapered
    - d. Overall Thickness: 1/2 inch or 5/8 inch as indicated on Drawings
    - e. Panel complies with requirements of ASTM C 1325 and ANSI A 118.9
    - f. Density: 72 lbs. per cu. ft.

- g. Water Absorption: Not greater than 8 percent when tested for 24 hours in accordance with ASTM C 473
- B. Cement Board Underlayment Basis of Design: PermaBase® brand Cement Board
  - 1. Panel Physical Characteristics
    - a. Core: Cementitious, water-durable
    - b. Surface: Fiberglass mesh on front and back
    - c. Long Edges: Tapered
    - d. Overall Thickness: 1/4 inch
    - e. Panel complies with requirements of ASTM C 1325 and ANSI A118.9
    - f. Density: 72 lbs per cu. ft.
    - g. Water Absorption: Not greater than 8 percent when tested for 24 hours in accordance with ASTM C 473

## 2.07 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
  - 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
  - 2. Shapes:
    - a. Cornerbead.
    - b. Bullnose bead.
    - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
    - d. L-Bead: L-shaped; exposed long flange receives joint compound.
    - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
    - f. Expansion (control) joint.
    - g. Curved-Edge Cornerbead: With notched or flexible flanges.
  - 3. Specialty Shapes:
    - a. Radiused bullnose and other specialty shapes as indicated on the Drawings, by Gordon, Fry or other approved equal.

## 2.08 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
  - 1. Interior Gypsum Board: Paper.
  - 2. Exterior Gypsum Soffit Board: Paper.
  - 3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
  - 4. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
  - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
  - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type or drying-type, all-purpose compound.
  - 3. Use setting-type compound for installing paper-faced metal trim accessories.
  - 4. Fill Coat: For the second coat, use drying-type, all-purpose compound.
  - 5. Finish Coat: For the third coat, use drying-type, all-purpose compound.
  - 6. Skim Coat: For the final coat of Level 5 finish, use drying-type, all-purpose compound.
- D. Joint Compound for Exterior Applications:

1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
  2. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.
- E. Joint Compound for Tile Backing Panels:
1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
  2. Cementitious Backer Units: As recommended by backer unit manufacturer.
  3. Enhanced Mold and Mildew Resistant Compound: ProForm XP Ready Mix Joint Compound, as manufactured by National Gypsum Company, or approved equal.

## 2.09 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. 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.
  2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- E. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
    - b. Grabber Construction Products; Acoustical Sealant GSC.
    - c. Hilti, Inc.; CP 506 Smoke and Acoustical Sealant.
    - d. Pecora Corporation; AC-20 FTR.
    - e. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
    - f. United States Gypsum Company; SHEETROCK Acoustical Sealant.
- F. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."
- G. Vapor Retarder: As specified in Section 072600 "Vapor Retarders."

## 2.10 TEXTURE FINISHES

- A. Primer: As recommended by textured finish manufacturer.
- B. Non-Aggregate Finish: Premixed, vinyl texture finish for spray application.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. CertainTeed Corporation; ProRoc Easi-Tex Spray Texture.
    - b. National Gypsum Company; ProForm Brand All Purpose Joint Compound, drying type, or ProForm BRAND Perfect Spray EM.
    - c. United States Gypsum Company; BEADEX FasTex Wall and Ceiling Spray Texture.

2. Texture: Light Orange peel or as selected by Architect.

### **PART 3 EXECUTION**

#### **3.01 APPLYING AND FINISHING PANELS**

- A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- B. Comply with ASTM C 840.
- C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- D. 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.
- E. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- F. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- G. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  2. Level 2: Panels that are substrate for tile.
  3. Level 3: Where indicated on Drawings.
  4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
    - a. Primer and its application to surfaces are specified in Section 09923 "Interior Painting."
  5. Level 5: Where indicated on Drawings.
    - a. Primer and its application to surfaces are specified in Section 09923 "Interior Painting."
- H. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.
- I. Cementitious Backer Units: Finish according to manufacturer's written instructions.

#### **3.02 APPLYING TEXTURE FINISHES**

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.

#### **3.03 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.

**END OF SECTION 09290**



## SECTION 09301 - CERAMIC TILE

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section Includes:
  - 1. Ceramic mosaic tile.
  - 2. Porcelain tile.
  - 3. Glazed wall tile.
  - 4. Stone thresholds.
  - 5. Tile backing panels.
  - 6. Waterproof membrane (for thinset applications).
  - 7. Metal edge strips.

#### 1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples:
  - 1. Each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide samples of each color blend.

#### 1.03 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 2 percent of amount installed for each type, composition, color, pattern, and size indicated.

#### 1.04 QUALITY ASSURANCE

- A. Installer Qualifications:
  - 1. Company specializing in performing the work of this section with minimum two years' experience.
  - 2. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
    - a. Build mockup of Large Heavy Format floor tile installation.
    - b. Build mockup of Large Heavy Format and Glass wall tile installation.
    - c. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.01 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide Standard-grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
- B. ANSI Glass Tile Standard: Provide Standard-grade tile that complies with ANSI A137.2 for types, compositions, and other characteristics indicated.

- C. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108/ A118/ A136.1, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

## 2.02 TILE PRODUCTS

- A. Ceramic Tile Type CT-1: Glazed porcelain tile.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Daltile Ever, or comparable product by one of the following:
    - a. Emil Limestone
    - b. Marazzi Soho
  2. Certification: Tile certified by the Porcelain Tile Certification Agency.
  3. Face Size: 12 by 24 inches..
  4. Face Size Variation: Rectified.
  5. Thickness: 5/16 inch.
  6. Face: Plain with square edges.
  7. Dynamic Coefficient of Friction: Not less than 0.42.
  8. Tile Color, Glaze, and Pattern: As selected by Architect from manufacturer's full range. Pattern as indicated on drawings.
  9. Grout Color: As selected by Architect from manufacturer's full range.
- B. Ceramic Tile Type CT-1: Glazed wall tile.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Daltile Semi-Gloss, or comparable product by one of the following:
    - a. American Olean Bright
    - b. Anatolia Soho Glossy
  2. Module Size: 4-1/4 by 4-1/4 inches and 3 by 6 inches.
  3. Face Size Variation: Rectified.
  4. Thickness: 5/16 inch.
  5. Face: Plain with modified square edges.
  6. Finish: Bright, opaque glaze.
  7. Tile Color and Pattern: As selected by Architect from manufacturer's full range, 50% Price Group 1 and 50% Price Group 2.
  8. Grout Color: As selected by Architect from manufacturer's full range.
  9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
    - a. Base: Coved, module size 4-1/4 by 4-1/4 inches and 6 by 3-3/4 inches.
    - b. Wainscot Cap: Surface bullnose, module size 4-1/4 by 4-1/4 inches.
    - c. External Corners: Surface bullnose, same size as adjoining flat tile.
    - d. Internal Corners: Field-buttet square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.
  10. Accessories for tile over tile application.

## 2.03 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.

- B. Marble Thresholds: ASTM C 503/C 503M, with a minimum abrasion resistance of according to ASTM C 1353 or ASTM C 241/C 241M and with honed finish.
  - 1. Description: Uniform, fine- to medium-grained white stone with gray veining.
- C. Non- Ceramic Trim: style and dimensions to suit application, for seating using tile mortar or adhesive: use in the following locations:
  - 1. Transition between floor finishes of different heights. Schluter RENO-U, or approved equal, in height as required. Satin nickel anodized aluminum.
  - 2. Thresholds at door openings. Schluter RENO-U, or approved equal, in height as required. Satin nickel anodized aluminum.
  - 3. Expansion and control joints, floor and wall. Schluter DILEX-BWB, or approved equal, in spacing as required.

#### 2.04 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, Type A.
  - 1. USG Durock or comparable product as required.
  - 2. Thickness: 5/8 inch.

#### 2.05 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Latex-Portland Cement Waterproof Mortar: Flexible, waterproof mortar consisting of cement-based mix and latex additive.
- C. Waterproofing and Tile-Setting Adhesive: One-part, fluid-applied product intended for use as both waterproofing and tile-setting adhesive in a two-step process.

#### 2.06 SETTING MATERIALS

- A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.
- B. Dry-Set Portland Cement Mortar (Thinset): ANSI A118.1.
  - 1. For wall applications, provide non sagging mortar.
- C. Latex-Portland Cement Mortar (Thinset): ANSI A118.4.
  - 1. Provide prepackaged, dry mortar mix to which only water must be added at Project site.
  - 2. For wall applications, provide non-sagging mortar.
- D. Water-Cleanable, Tile-Setting Epoxy: ANSI A118.3.
- E. Organic Adhesive: ANSI A136.1, Type I.

#### 2.07 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.
- B. Standard Cement Grout: ANSI A118.6.
- C. High-Performance Tile Grout: ANSI A118.7.
- D. Water-Cleanable Epoxy Grout: ANSI A118.3.
- E. Grout for Pregrouted Tile Sheets: Same product used in factory to pregrout tile sheets.

## 2.08 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, Portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; Satin nickel anodized extruded aluminum exposed-edge material.
  - 1. Open edges of wall tile. Provide Schluter JOLLY, or approved equal, in height as required.
- C. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
  - 2. Verify that concrete substrates for tile floors installed with bonded mortar bed and thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

### 3.03 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation 2015" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
  - a. Tile floors in wet areas.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Where accent tile differs in thickness from field tile, vary setting bed thickness so that tiles are flush.
- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
- G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
  1. Ceramic Mosaic Tile: 1/8 inch.
  2. Glazed Wall Tile: 1/16 inch.
  3. Porcelain Tile: 1/8 inch.
- H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
  1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- J. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
  1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-Portland cement mortar (thinset).
- K. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.
- L. Floor Sealer: Apply floor sealer to cementitious grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.
- M. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-Portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.
- N. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
- O. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.

### 3.04 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

#### A. Tile Over Tile Application:

1. Follow TCNA Guidelines for tile over tile installation on walls - Restrooms.
2. Rough up Existing Wall Tile as directed for new glazed wall tile installation.
3. Infill existing voids, gaps, missing tile, and make existing substrate solid and stable prior to installing new glazed wall tile.

**END OF SECTION 09301**

## SECTION 09653 - RESILIENT BASE AND ACCESSORIES

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section Includes:
  - 1. Resilient base.
  - 2. Resilient molding accessories.

#### 1.02 SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

### PART 2 PRODUCTS

#### 2.01 THERMOPLASTIC-RUBBER BASE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Burke Mercer Flooring Products, or comparable product by one of the following:
  - 1. Armstrong World Industries, Inc.
  - 2. Flexco.
  - 3. Johnsonite; A Tarkett Company.
  - 4. Mondo America Inc.
  - 5. Nora Systems, Inc.
  - 6. Roppe Corporation, USA.
- B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).
  - 1. Group: I (solid, homogeneous)
  - 2. Style and Location:
    - a. Style A, straight: Provide in areas with carpet.
    - b. Style B, Cove: Provide areas with resilient flooring.
    - c. Style C, Butt to: Provide in areas indicated.
- C. Thickness: 0.125 inch.
- D. Height: 4 inches or 6 inches as indicated on Drawings.
- E. Lengths: Coils in manufacturer's standard length. Use cut lengths only as directed by architect.
- F. Outside Corners: Preformed unless required otherwise.
- G. Inside Corners: Job formed or preformed.
- H. Colors: As selected by Architect from full range of industry colors.

#### 2.02 VINYL MOLDING ACCESSORY

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Burke Mercer Flooring Products, or comparable product by one of the following:
  - 1. Armstrong World Industries, Inc.
  - 2. Flexco.
  - 3. Johnsonite; A Tarkett Company.

4. Roppe Corporation, USA.
  5. Mannington Commercial.
- A. Description: Rubber cap for cove carpet, cap for cove resilient flooring, carpet edge for glue-down applications, nosing for carpet, nosing for resilient flooring, reducer strip for resilient flooring, joiner for tile and carpet, and transition strips.
  - B. Profile and Dimensions: As indicated on drawings.
  - C. Locations: Provide rubber molding accessories as required by condition
  - D. Colors and Patterns: As selected by Architect from full range of industry colors.

### 2.03 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient- product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are the same temperature as the space where they are to be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

### 3.02 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:
  1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
    - a. Form without producing discoloration (whitening) at bends.
  2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
    - a. Miter or cope corners to minimize open joints.



### 3.03 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

### 3.04 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 09653

## SECTION 09659 - RESILIENT TILE FLOORING

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section Includes:
  - 1. Vinyl composition floor tile.

#### 1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
  - 1. Show details of special patterns.
- C. Samples: Full-size units of each color and pattern of floor tile required.

#### 1.03 CLOSEOUT SUBMITTALS

- A. Maintenance data.

### PART 2 - PRODUCTS

#### 2.01 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

#### 2.02 VINYL COMPOSITION FLOOR TILE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Johnsonite Azrock, or comparable product by one of the following:
  - 1. Mannington Essentials
  - 2. Armstrong Standard Excelon
- B. Tile Standard: ASTM F 1066, Class 2, through-pattern tile.
- C. Wearing Surface: Smooth.
- D. Thickness: 0.125 inch
- E. Size: 12 by 12 inches.
- F. Colors and Patterns: As selected by Architect from full range of industry colors.

#### 2.03 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
- C. "PerfectPaint" Asbestos Floor Tile sealer by Specialty Solutions Mfg., Inc.

- D. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
  - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
    - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of MVER shall not exceed 5 lbs./1000 sq. ft./24 hours in 24 hours.
    - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 80 percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.
- F. Install floor tile sealer prior to any VCT tile work.

### **3.02 FLOOR TILE INSTALLATION**

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
  - 1. Lay tiles square with room axis.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
  - 1. Lay VCT tiles with grain direction alternating in adjacent tiles (basket-weave pattern).

- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

### 3.03 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Polish: By Owner.
- C. Cover floor tile until Substantial Completion.

**END OF SECTION 09659**

## SECTION 09913 - EXTERIOR PAINTING

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section includes surface preparation and the application of paint systems on exterior substrates as included in the Drawings.
  - 1. Concrete.
  - 2. Concrete masonry units (CMU).
  - 3. Steel.
  - 4. Galvanized metal.
  - 5. Wood.
  - 6. Plastic trim fabrications.
  - 7. Exterior Portland Cement Plaster (stucco).
- B. Related Requirements:
  - 1. Section 05500 "Metal Fabrications" for shop priming of metal substrates with primers specified in this Section.

#### 1.02 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523, a matte flat finish.
- B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523, a high-side sheen flat, velvet-like finish.
- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523, an eggshell finish.
- D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523, a satin-like finish.
- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523, a semi-gloss finish.
- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523, a gloss finish.

#### 1.03 SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
  - 1. Submit Samples on rigid backing, 8 inches square.
  - 2. Step coats on Samples to show each coat required for system.
  - 3. Label each Sample for location and application area.
- C. 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. VOC content.
- D. Coating Maintenance Manual: Provide coating maintenance manual including area summary with finish schedule, area detail designating location where each product/color/finish was used, product data pages, material safety data sheets, care

and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

#### 1.04 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

#### 1.05 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
    - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
    - b. Other Items: Architect will designate items or areas required.
  - 2. Final approval of color selections will be based on mockups.
    - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Handling: Deliver products to Project site in an undamaged condition in manufacturer's original sealed containers, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Packaging shall bear the manufacturer's label with the following information:
  - 1. Product name and type (description).
  - 2. Batch date.
  - 3. Color number.
  - 4. VOC content.
  - 5. Environmental handling requirements.
  - 6. Surface preparation requirements.
  - 7. Application instructions.
- B. 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.

#### 1.07 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

- B. Do not apply paints 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. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  - 1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams Company products indicated or comparable product from one of the following:
  - 1. Benjamin Moore & Co.
  - 2. Sherwin Williams
  - 3. Glidden Professional, Division of PPG Architectural Finishes, Inc.
  - 4. PPG Architectural Finishes, Inc.
  - 5. Other prior approved manufacturers.
- B. Source Limitations: Obtain paint materials from single source from single listed manufacturer.
- C. Manufacturer's designations listed on a separate color schedule are for color reference only and do not indicate prior approval.

### 2.02 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. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.
- C. Colors: As selected by Architect from manufacturer's full range.
  - 1. 20 percent of surface area will be painted with deep tones.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers. Where acceptability of substrate conditions is in question, apply samples and perform in-situ testing to verify compatibility, adhesion, and film integrity of new paint application.

1. Report, in writing, conditions that may affect application, appearance, or performance of paint.
- B. Substrate Conditions:
  1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
    - a. Concrete: 12 percent.
    - b. Masonry (Clay and CMU): 12 percent.
    - c. Wood: 15 percent.
    - d. Portland Cement Plaster: 12 percent.
    - e. Gypsum Board: 12 percent.
  2. Portland Cement Plaster Substrates: Verify that plaster is fully cured.
  3. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- C. Proceed with coating application only after unsatisfactory conditions have been corrected; application of coating indicates acceptance of surfaces and conditions.

### 3.02 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Existing Steel, Unprimed Steel or Incompatible Coatings: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
  1. SSPC-SP 2, "Hand Tool Cleaning."
  2. SSPC-SP 3, "Power Tool Cleaning."
  3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
  4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove loose surface oxidation.
- J. Wood Substrates:



1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
  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.
- K. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

### 3.03 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
1. Use applicators and techniques suited for paint and substrate indicated.
  2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
  3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
  4. Paint entire exposed surface of steel window frames and sashes.
  5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint undercoats at deep colors with the same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
1. Paint the following work where exposed to view:
    - a. Equipment, including panelboards.
    - b. Uninsulated metal piping.
    - c. Uninsulated plastic piping.
    - d. Pipe hangers and supports.
    - e. Metal conduit.
    - f. Plastic conduit.
    - g. Tanks that do not have factory-applied final finishes.

### 3.04 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
1. Contractor shall touch up and restore painted surfaces damaged by testing.

2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

### 3.05 CLEANING AND PROTECTION

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

### 3.06 EXTERIOR PAINTING SCHEDULE

- A. Concrete, Portland Cement Plaster (Stucco), Cementitious Siding, Nontraffic Surfaces:
  1. Latex System:
    - a. Prime Coat: Primer sealer, latex, exterior: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300, at 8.0 mils wet, 3.2 mils dry.
    - b. Intermediate Coat: Latex, exterior, matching topcoat.
    - c. Topcoat: Latex, exterior, low-sheen: S-W A-100 Exterior Latex Flat, A6 Series or Low Sheen, A12 Series, at 4.0 mils wet, 1.5 mils dry, per coat.
  2. Latex Aggregate/Latex System:
    - a. Prime Coat: Block Filler, Latex, Interior/Exterior: S-W Loxon Block Surfacer, A24W200, at 50 to 100 sq. ft. per gal (1.2 to 2.4 sq. m per l).
    - b. Topcoat: Latex, exterior flat, fine, medium or coarse texture as selected: S-W UltraCrete Textured Masonry Topcoat, A44-800 Series, at 50 to 80 sq ft./gal. 50 to 100 sq. ft. per gal.
- B. CMU Substrates:
  1. Latex System:
    - a. Block Filler: Block filler, latex, interior/exterior: S-W PrepRite Block Filler, B25W25, at 75 to 125 sq. ft. per gal (1.8 to 3.1 sq. m per l).
    - b. Intermediate Coat: Latex, exterior, matching topcoat.
    - c. Topcoat: Latex, exterior, satin: S-W A-100 Exterior Latex Satin, A82 Series, at 4.0 mils wet, 1.5 mils dry, per coat.
- C. Ferrous Metal, Galvanized-Metal, and Aluminum Substrates:
  1. Water-Based Light Industrial Coating System:
    - a. Prime Coat: Primer, water-based, anti-corrosive for metal: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series, 5.0 to 10.0 mils wet, 2.0 to 4.0 mils dry. Spot prime any damaged shop primer if steel is already shop primed.
    - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.

- c. Topcoat: Light industrial coating, exterior, water based, semi-gloss: S-W Pro Industrial Acrylic Semi-Gloss Coating, B66-650 Series, at 2.5 to 4.0 mils dry, per coat.
- D. Wood Substrates: Including exposed wood items not indicated to receive shop-applied finish.
  - 1. Latex System:
    - a. Prime Coat: Primer, latex for exterior wood.
    - b. Intermediate Coat: Latex, exterior, matching topcoat.
    - c. Topcoat: Latex, exterior, satin: S-W A-100 Exterior Latex Satin, A82 Series, at 4.0 mils wet, 1.5 mils dry, per coat.
- E. Plastic Trim Fabrication Substrates: Including architectural PVC, plastic, and fiberglass items.
  - 1. Latex System:
    - a. Prime Coat: Primer, bonding, water-based: S-W PrepRite ProBlock Latex Primer/Sealer.
    - b. Intermediate Coat: Latex, exterior, matching topcoat.
    - c. Topcoat: Latex, exterior, low-sheen: S-W A-100 Exterior Latex Flat, A6 Series or Low Sheen, A12 Series, at 4.0 mils wet, 1.5 mils dry, per coat.
- F. Exterior Gypsum Board Substrates:
  - 1. Latex System:
    - a. Prime Coat: Primer, bonding, water-based: S-W PrepRite ProBlock Latex Primer/Sealer.
    - b. Intermediate Coat: Latex, exterior, matching topcoat.
    - c. Topcoat: Latex, exterior, satin: S-W A-100 Exterior Latex Satin, A82 Series, at 4.0 mils wet, 1.5 mils dry, per coat.
- G. Exterior Insulation Finish Systems (EIFS):
  - 1. Latex System:
    - a. First Coat: Latex, exterior, matching topcoat.
    - b. Topcoat: Latex, exterior, low-sheen: S-W A-100 Exterior Latex Flat, A6 Series or Low Sheen, A12 Series, at 4.0 mils wet, 1.5 mils dry, per coat.

END OF SECTION 09913

## SECTION 09923 - INTERIOR PAINTING

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section includes surface preparation and the application of paint systems on interior substrates as included in the Drawings.
  - 1. Concrete.
  - 2. Clay masonry.
  - 3. Concrete masonry units (CMU).
  - 4. Steel.
  - 5. Cast iron.
  - 6. Galvanized metal.
  - 7. Aluminum (not anodized or otherwise coated).
  - 8. Wood.
  - 9. Gypsum board.
  - 10. Plaster.
  - 11. Spray-textured ceilings.
  - 12. Cotton or canvas insulation covering.
  - 13. ASJ insulation covering.
- B. Related Requirements:
  - 1. Section 05500 "Metal Fabrications" for shop priming of metal substrates with primers specified in this Section.
  - 2. Section 13121 "Pre-Engineered Metal Buildings" for painting of exposed steel.
  - 3. Section 09913 "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.
  - 4. Section 099300 "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on interior wood substrates.

#### 1.02 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523, a matte flat finish.
- B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523, a high-side sheen flat, velvet-like finish.
- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523, an eggshell finish.
- D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523, a satin-like finish.
- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523, a semi-gloss finish.
- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523, a gloss finish.

#### 1.03 SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.

- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
  - 1. Submit Samples on rigid backing, 8 inches square.
  - 2. Step coats on Samples to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.
- C. 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. VOC content.
- D. Coating Maintenance Manual: Provide coating maintenance manual including area summary with finish schedule, area detail designating location where each product/color/finish was used, product data pages, material safety data sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

#### 1.04 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

#### 1.05 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
    - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
    - b. Other Items: Architect will designate items or areas required.
  - 2. Final approval of color selections will be based on mockups.
    - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Handling: Deliver products to Project site in an undamaged condition in manufacturer's original sealed containers, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Packaging shall bear the manufacturer's label with the following information:
  - 1. Product name and type (description).
  - 2. Batch date.
  - 3. Color number.
  - 4. VOC content.

5. Environmental handling requirements.
  6. Surface preparation requirements.
  7. Application instructions.
- B. 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.

#### 1.07 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
- C. Lead Paint: It is not expected that lead paint will be encountered in the Work.
1. If suspected lead paint is encountered, do not disturb; immediately notify Architect and Owner.

### **PART 2 PRODUCTS**

#### 2.01 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams Company products indicated or comparable product from one of the following:
1. Benjamin Moore & Co.
  2. Duron, Inc.
  3. Glidden Professional, Division of PPG Architectural Finishes, Inc.
  4. PPG Architectural Finishes, Inc.
  5. Pratt & Lambert.
  6. Other prior approved manufacturers.
- B. Source Limitations: Obtain paint materials from single source from single listed manufacturer.
1. Manufacturer's designations listed on a separate color schedule are for color reference only and do not indicate prior approval.

#### 2.02 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. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.
- C. Colors: As selected by Architect from manufacturer's full range.
1. 20 percent of surface area will be painted with deep tones.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers. Where acceptability of substrate conditions is in question, apply samples and perform in-situ testing to verify compatibility, adhesion, and film integrity of new paint application.
- B. Substrate Conditions:
  - 1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
    - a. Concrete: 12 percent.
    - b. Masonry (Clay and CMU): 12 percent.
    - c. Wood: 15 percent.
    - d. Gypsum Board: 12 percent.
    - e. Plaster: 12 percent.
  - 2. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
  - 3. Plaster Substrates: Verify that plaster is fully cured.
  - 4. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.
- C. Proceed with coating application only after unsatisfactory conditions have been corrected; application of coating indicates acceptance of surfaces and conditions.

### 3.02 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. 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.
  - 1. Concrete Floors: Remove oil, dust, grease, dirt, and other foreign materials. Comply with SSPC-SP-13/NACE 6 or ICRI 03732.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.
- F. Existing Steel, Unprimed Steel or Incompatible Coatings: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
  - 1. SSPC-SP 2, "Hand Tool Cleaning."

2. SPC-SP 3, "Power Tool Cleaning."
  3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
  4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. 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.
- I. Aluminum Substrates: Remove loose surface oxidation.
- J. 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.
- K. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

### 3.03 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
1. Use applicators and techniques suited for paint and substrate indicated.
  2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
  4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat at deep colors with a lighter shade of the topcoat to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
1. Paint the following work where exposed in occupied spaces:
    - a. Equipment, including panelboards.
    - b. Uninsulated metal piping.
    - c. Uninsulated plastic piping.
    - d. Pipe hangers and supports.
    - e. Metal conduit.
    - f. Plastic conduit.



- g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
  - h. Other items as directed by Architect.
2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

### 3.04 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
  1. Contractor shall touch up and restore painted surfaces damaged by testing.
  2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

### 3.05 CLEANING AND PROTECTION

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

### 3.06 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces and Clay Masonry:
  1. Latex System:
    - a. Prime Coat: Primer sealer, latex, interior: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300, at 8.0 mils wet, 3.2 mils dry.
    - b. Intermediate Coat: Latex, interior, matching topcoat.
    - c. Topcoat: Latex, interior, eggshell: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series, at 4.0 mils wet, 1.7 mils dry, per coat.
  2. Water-Based Light Industrial Coating System:
    - a. Prime Coat: Primer sealer, latex, interior: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300, at 8.0 mils wet, 3.2 mils dry.
    - b. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
    - c. Topcoat: Light industrial coating, interior, water based, semi-gloss: S-W Pro Industrial Pre-Catalyzed Water Based Epoxy, K46-151 Series, at 4.0 mils wet, 1.5 mils dry, per coat.
  3. Two-Component Epoxy and Epoxy High Build Systems for Non-Traffic Surfaces: Refer to Section 099600 "High-Performance Coatings."
  4. Concrete Stain System (Water-based) for Vertical Surfaces:
    - a. First Coat: S-W H&C Concrete Stain Solid Color Water Based, at 50 to 300 sq. ft. per gal (1.2 to 7.4 sq. m per l).

- b. Second Coat: S-W H&C Concrete Stain Solid Color Water Based, at 50 to 300 sq. ft. per gal (1.2 to 7.4 sq. m per l).
- B. Concrete Substrates, Pedestrian Traffic Surfaces:
  1. Latex Floor Enamel System:
    - a. First Coat: Floor paint, latex, slip-resistant, matching topcoat.
    - b. Topcoat: Floor paint, latex, slip-resistant, low gloss: S-W ArmorSeal Tread-Plex, B90 Series, at 1.5 to 2.0 mils dry per coat.
  2. Clear Acrylic System, Gloss Finish:
    - a. First Coat: S-W H&C Concrete Sealer Wet Look Water Base, at 100 to 200 sq. ft. per gal (2.4 to 4.9 sq. m per l).
    - b. Second Coat: S-W H&C Concrete Sealer Wet Look Water Base, at 100 to 200 sq. ft. per gal (2.4 to 4.9 sq. m per l).
  3. Concrete Stain System (Water-based):
    - a. First Coat: Low-luster opaque finish: S-W H&C Concrete Stain Solid Color Water Based, at 50 to 300 sq. ft. per gal (1.2 to 7.4 sq. m per l).
    - b. Second Coat: Low-luster opaque finish: S-W H&C Concrete Stain Solid Color Water Based, at 50 to 300 sq. ft. per gal (1.2 to 7.4 sq. m per l).
  4. Epoxy and Urethane Coatings: Refer to Section 099600 "High-Performance Coatings."
  5. Epoxy- and Urethane- Based Aggregate-Filled Floor Surfacing: Refer to Section 09 67 23 "Resinous Flooring."
- C. CMU Substrates:
  1. Latex System:
    - a. Block Filler: Block filler, latex, interior/exterior: S-W PrepRite Block Filler, B25W25, at 100 to 200 sq. ft. per gal (2.4 to 4.9 sq. m per l).
    - b. Intermediate Coat: Latex, interior, matching topcoat.
    - c. Topcoat: Latex, interior, semi-gloss: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series, at 4.0 mils wet, 1.6 mils dry, per coat.
  2. Water-Based Light Industrial Coating System:
    - a. Block Filler: Block filler, latex, interior/exterior: S-W PrepRite Block Filler, B25W25, at 100 to 200 sq. ft. per gal (2.4 to 4.9 sq. m per l).
    - b. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
    - c. Topcoat: Light industrial coating, interior, water based, semi-gloss: S-W Pro Industrial Pre-Catalyzed Water Based Epoxy, K46-151 Series, at 4.0 mils wet, 1.5 mils dry, per coat.
  3. Concrete Stain System (Water-based):
    - a. First Coat: S-W H&C Concrete Stain Solid Color Water Based, at 50 to 300 sq. ft. per gal (1.2 to 7.4 sq. m per l).
    - b. Second Coat: S-W H&C Concrete Stain Solid Color Water Based, at 50 to 300 sq. ft. per gal (1.2 to 7.4 sq. m per l).
  4. Two-Component Epoxy and Epoxy High Build Systems for Non-Traffic Surfaces: Refer to Section 099600 "High-Performance Coatings."
  5. Epoxy and Urethane Coatings: Refer to Section 099600 "High-Performance Coatings."
- D. Metal Substrates (Aluminum, Steel, Galvanized Steel):
  1. Latex System:
    - a. Prime Coat: Primer, rust-inhibitive, water based: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series, at 5.0 to 10 mils wet, 2.0 to 4.0 mils dry.
    - b. Intermediate Coat: Water-based acrylic, interior, matching topcoat.
    - c. Topcoat: Water-based acrylic, semi-gloss: S-W Pro Industrial Acrylic Semi-Gloss

- Coating, B66-650 Series or Gloss Coating, B66-660 Series, at 2.5 to 4.0 mils dry, per coat.
2. Water-Based Dry-Fall System:
    - a. Top Coat: Dry-fall latex, flat: S-W Pro Industrial Waterborne Acrylic Dryfall Flat, B42-80 Series, at 6.0 mils wet, 1.7 mils dry.
  3. Water-Based Light Industrial Coating System:
    - a. Prime Coat: Primer, rust-inhibitive, water based: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series, at 5.0 to 10.0 mils wet, 2.0 to 4.0 mils dry.
    - b. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
    - c. Topcoat: Light industrial coating, interior, water based, semi-gloss: S-W Pro Industrial Pre-Catalyzed Water Based Epoxy, K46-151 Series, at 4.0 mils wet, 1.5 mils dry, per coat.
  4. Two-Component Epoxy and Epoxy High Build Systems: Refer to Section 099600 "High-Performance Coatings."
  5. Acrylic/Alkyd System:
    - a. Prime Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series, at 5.0 to 10.0 mils wet, 2.0 to 4.0 mils dry.
    - b. Intermediate Coat: Water-based acrylic-alkyd, interior, matching topcoat.
    - c. Topcoat: Water-based acrylic-alkyd, semi-gloss, interior: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series or Gloss, B35-8200 Series, at 4.0 mils wet, 1.7 mils dry, per coat.
- E. Wood Substrates: Including exposed wood items not indicated to receive shop-applied finish.
1. Latex System:
    - a. Prime Coat: Primer sealer, latex, interior: S-W PrepRite ProBlock Primer Sealer, B51-620 Series, at 4.0 mils wet, 1.4 mils dry.
    - b. Intermediate Coat: Latex, interior, matching topcoat.
    - c. Topcoat: Latex, interior, semi-gloss: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series, at 4.0 mils wet, 1.6 mils dry, per coat.
  2. Acrylic/Alkyd System:
    - a. Prime Coat: Primer sealer, latex, interior: S-W Premium Wall & Wood Primer, B28W8111, at 4.0 mils wet, 1.8 mils dry.
    - b. Intermediate Coat: Water-based acrylic-alkyd, interior, matching topcoat.
    - c. Topcoat: Water-based acrylic-alkyd, semi-gloss, interior: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series, at 4.0 mils wet, 1.7 mils dry, per coat.
  3. Water-Based Light Industrial Coating System:
    - a. Prime Coat: Primer sealer, latex, interior: S-W PrepRite ProBlock Primer Sealer, B51-620 Series, at 4.0 mils wet, 1.4 mils dry.
    - b. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat
    - c. Topcoat: Light industrial coating, interior, water based, semi-gloss: S-W Pro Industrial Pre-Catalyzed Water Based Epoxy, K46-151 Series, at 4.0 mils wet, 1.5 mils dry, per coat.
  4. Two-Component Epoxy and Epoxy High Build Systems: Refer to Section 099600 "High-Performance Coatings."
- F. Wood Substrates, Pedestrian Traffic Surfaces:
1. Latex Floor Enamel System:
    - a. First Coat: Floor paint, latex, slip-resistant, matching topcoat.
    - b. Topcoat: Floor paint, latex, slip-resistant, low gloss: S-W ArmorSeal Tread-Plex,

B90 Series, at 1.5 to 2.0 mils dry per coat.

G. Gypsum Board Plaster and Spray-Texture Ceiling Substrates:

1. Latex System:
  - a. Prime Coat: Primer, latex, interior: S-W ProMar 200 Zero VOC Latex Primer, B28W2600, at 4.0 mils wet, 1.5 mils dry.
  - b. Intermediate Coat: Latex, interior, matching topcoat.
  - c. Topcoat: Latex, interior, eggshell: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series, at 4.0 mils wet, 1.7 mils dry, per coat.
2. Water-Based Light Industrial Coating System:
  - a. Prime Coat: Primer sealer, latex, interior: S-W ProMar 200 Zero VOC Latex Primer, B28W2600, at 4.0 mils wet, 1.5 mils dry.
  - b. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
  - c. Topcoat: Light industrial coating, interior, water based, semi-gloss: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46-151 Series, at 4.0 mils wet, 1.5 mils dry, per coat.
3. Two-Component Epoxy and Epoxy High Build Systems for Non-Traffic Surfaces: Refer to Section 099600 "High-Performance Coatings."

**END OF SECTION 09923**

## SECTION 09965 - ELASTOMERIC COATINGS

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

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

#### 1.02 SUMMARY

- A. Provide a cold fluid-applied, water-resistive, vapor-permeable elastomeric acrylic coating system with crack bridging (if required) and anti-carbonation properties on concrete and other acceptable substrates.
  - 1. Work includes substrate preparation including crack and joint treatment.
  - 2. Work includes bridging and sealing air leakage and water intrusion pathways and gaps including connections of wall and roof membrane, and penetrations of the building envelope including piping, conduit, ducts and similar items.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
  - 1. Section 03300 – CAST-IN-PLACE CONCRETE.
  - 2. Section 07600 – FLASHING AND SHEET METAL.
  - 3. Section 07 92 13 – ELASTOMERIC JOINT SEALANTS

#### 1.03 PERFORMANCE REQUIREMENTS

- A. Cold fluid-applied, water-resistive, vapor-permeable elastomeric acrylic coating system is intended to perform as a continuous barrier against liquid water and carbonation intrusion, and to flash or discharge incidental water off the exterior. Coating system shall accommodate movements of building materials as required with accessory sealant materials at such locations, changes in substrate, perimeter conditions and penetrations.
  - 1. System shall perform as a continuous barrier against liquid water and carbonation intrusion.
  - 2. Manufacturer shall provide all primary cold fluid applied, water resistive, vapor permeable elastomeric acrylic coating materials that are physically and chemically compatible when installed in accordance with manufacturer's current application requirements.

#### 1.04 SUBMITTALS

- A. Submittals: Comply with project requirements for submittals as specified in Division 01.
- B. Product Data:
  - 1. Materials list of items proposed to be provided under this Section.
  - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
- C. Samples: For color verification, provide actual Samples of each type of product proposed for use.

- D. Site mockup: For confirmation of color selection, construction sequencing and standard of acceptance. Complete prior to commencing with the project.
- E. Pre-Construction Field Adhesion Testing: Written results of field tests, including summary of joint preparation, products used and installation techniques.

#### 1.05 QUALITY ASSURANCE

- A. Installer Qualifications:
  - 1. Installer shall have at least five years of experience in installing materials of types specified and shall have successfully completed at least three projects of similar scope and complexity.
  - 2. Installer shall designate a single individual as project foreman who shall be on site at all times during installation.
- B. Applicable Regulations: Comply with local code and requirements of authorities having jurisdiction. Do not exceed VOC regulations as established by the State in which they are being installed; including total VOC content, in grams per liter, for all system components (i.e. primers, adhesives, coatings, and similar items.)

#### 1.06 PRE-INSTALLATION CONFERENCE

- A. Prior to scheduled commencement of the coating installation and associated work, conduct a meeting at the project site with the installer, architect/consultant, owner, manufacturer's representative and any other persons directly involved with the performance of the Work. The Installer shall record conference discussions and to include decisions and agreements reached (or disagreements), and furnish copies of recorded discussions to each attending party. The main purpose of this meeting is to review foreseeable methods and procedures related to the Work.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. Elastomeric acrylic coating materials must be delivered in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers. Damaged material must be removed from the site immediately.
- B. Store elastomeric acrylic coating materials off the ground and protect from rain, freezing or excessive heat until ready for use.
- C. Condition the specified product as recommended by the manufacturer.

#### 1.08 PROJECT CONDITIONS

- A. Environmental Conditions: Do not apply material if it is raining or snowing or if such conditions appear to be imminent. Minimum application temperature is 45 degrees F and rising.
- B. Protection: Precautions should be taken to avoid damage to any surfaces near the work zone due to mixing and handling of the specified material.

#### 1.09 WARRANTY

- A. Warranty: Provide manufacturer's standard warranty for each type of product. Warranty shall include manufacturer's statement that materials in contact with another have been tested and verified to be compatible. Include written testing documentation and test reports if requested by Architect.

## PART 2 – PRODUCTS

### 2.01 MANUFACTURER

- A. Basis-of-Design Manufacturer: Sika Corporation, 201 Polito Avenue, Lyndhurst NJ 07071. Toll Free 800-933-SIKA (7452), www.sikausa.com. Or equal by prior approval by the Architect.
- B. Elastomeric Acrylic Coating: Sikagard 550W Elastocolor 100% acrylic emulsion with the following properties:
1. Tensile properties (ASTM D-412 Modified) 7 day tensile strength 190 psi (1.3 MPa).
  2. Elongation at break 610% @ 73 degrees F, 230% @ 0.
  3. Crack bridging properties (16 mils = 400 microns DFT). Static (-4 degrees F) 30 mils. Dynamic: >1000 cycles (-4 degrees F) 12 mils.
  4. Resistance to wind driven rain (TT-C-555B): No passage of water through coating.
  5. Weathering (ASTM G-23) 10,000 hours excellent, no chalking or cracking.
  6. Moisture vapor permeability (ASTM E96): 14.5 perms
  7. Water vapor diffusion:  $\mu\text{H}_2\text{O}$ , 2,146
  8. Water vapor diffusion resistance at 16 mils thick:  $\text{SdH}_2\text{O}$  = 2.6 ft. equivalent air thickness.
  - 9.
  10. Carbon dioxide diffusion:  $\mu\text{CO}_2$  214,000
  11. Carbon dioxide diffusion resistance at 16 mils thick (400microns):  $\text{SdCO}_2$  = 299 ft. (Equivalent air thickness) i.e. Approximately 9 inches of concrete cover.
  12. Solids content: by weight: 62%, by volume: 55%
  13. Fire resistance (ASTM E-84) Class Rating A: Flame Spread Index = 5, Smoke Development Index = 5.
  14. Application temperature (ambient and substrate): 45°-100°F.
  15. Tack free time 6 Hours @ 73 degrees F, 50% Relative Humidity.
  16. Full cure time approximately 24 Hours.
  17. Pot life: Indefinite.
  18. Capable of bridging dynamically moving cracks at low temperatures.
  19. Resistant to dirt pick-up and mildew.
  20. Color as selected by Architect from manufacturer's standard colors.
- C. Acrylic Coating Primer (if required): Sikagard 552 Primer, one component water base acrylic penetrating primer and adhesion promoter specifically formulated for use with Sikagard Base Coat and Elastocolor Coating with the following properties:
1. Low VOC.
  2. Solids content 20% by volume .
  3. Application temperature (ambient and substrate): 45°-100°F.
  4. Recoat time 4 – 24 hours.
- D. Testing: Unless indicated otherwise, performance testing in this Sections was performed at ambient temperature, with curing conditions of 73 degrees F and 50 percent relative humidity.
- E. Concrete Repair and Patching Materials: As recommended by manufacturer of elastomeric coating.
- F. Elastomeric Sealants: As recommended by manufacturer of elastomeric coating. For exterior joints in vertical surfaces such as, but not limited to control and/or expansion joints in cast-in-place concrete or unit masonry, joints between architectural pre-cast concrete units, joints between dissimilar materials or perimeter joints at frames of doors, windows, storefronts, louvers and similar openings apply a low-modulus, single-

component or multi-component non-sag sealant in compliance with ASTM C920, Type S or M, Grade NS, Class 25, Class 35, Class +50/-50, Class +100/-50. Acceptable products:

1. Sikaflex 15 Im a low-modulus, high-performance, 1-component, polyurethane-based, non-sag elastomeric sealant.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that surfaces and conditions are ready to accept the Work of this section. Verify surfaces are clean, dry, sound and free of voids, deformations, protrusions and contaminants that may inhibit application or performance of the elastomeric coatings. Notify Architect in writing of any discrepancies. Commencement of the Work in an area shall mean Installer's acceptance of the substrate.

### **3.02 PREPARATION**

- A. Verify that the surfaces are clean and smooth, free of depressions, waves, or projections, and horizontal surfaces are properly sloped to drains. Fill voids, gaps and spalled areas in substrate to provide a uniform even surface.
- B. Verify that all openings or penetrations through the work area are appropriately treated and secured back to solid blocking.
- C. Ensure all preparatory Work including curbs and upturn details are complete prior to applying the coating.
- D. Substrates must be clean, sound, and free of surface contaminants or other contaminants deleterious to the adhesion or bond of the coating. Remove dust, laitance, and grease, oils, curing compounds, form release agents and all foreign particles by mechanical means. Substrate shall be in accordance with ICRI Guideline No. 03732 for coatings and fall within CSP1 to CSP3.

### **3.03 APPLICATION OF CONCRETE REPAIR AND PATCHING MATERIALS**

- A. Fill all visible hairline cracks and surface defects with appropriate repair mortar, leveling mortar or surface filler prior to applying coating primer. Bugholes or irregularities of substrate shall be leveled with specified leveling mortar or surface fillers as appropriate.

### **3.04 CRACK TREATMENT FOR MASONRY AND CONCRETE**

- A. For non-structural, moving cracks, 12 mils or less and static cracks 30 mils or less, apply 2 coats of a crack bridging coating in accordance with the Product Data Sheet.
- B. For non-structural, moving cracks, greater than 12 mils and static cracks greater than 30 mils, rout and seal the crack to a 1/4 inch by 1/4-inch profile and properly seal with a flexible, specified elastomeric joint sealant.
- C. For structural static cracks, inject with a suitable epoxy.

### **3.05 APPLICATION OF PRIMER**

- A. Apply primer coat to concrete and mineral substrates, very porous substrates or when over-coating existing coatings which are firmly bonded.



- B. Surfaces to be primed must be dry, clean, sound, and free of curing compound residues and other bond inhibiting material. Any areas of exposed glass shall be protected by masking.
- C. Concrete and masonry surfaces shall be cleaned with high pressure water blast or use other approved mechanical means to achieve a roughened substrate.
- D. Apply in accordance with manufacturer's recommendations. Stir thoroughly using a slow speed (400-600 rpm) drill and paddle prior to application. Apply primer by brush, roller or spray equipment at a coverage rate no greater than 320 sq. ft./gal.
- E. Apply two coats on very absorbent surfaces. Allow a minimum of 4 hours prior to re-coating.

### 3.06 APPLICATION OF BASE COAT

- A. Mix base coat thoroughly using a low speed (400-600 rpm) drill and paddle prior to application.
- B. Apply by brush, roller, or spray over entire area moving in one direction. A minimum of two coats may be necessary to obtain the proper dry film thickness. See manufacturer's Technical Data Sheet for coverage rates and dry film thickness. Allow a minimum of 3 hours prior to re-coating.

### 3.07 APPLICATION OF ELASTOMERIC ACRYLIC COATING

- A. Mix elastomeric coating thoroughly with a low speed (400-600rpm) mixing drill and paddle prior to application.
- B. Apply by bristle brush, roller or spray equipment. Apply a continuous and uniform coat over the entire area moving in one direction at a coverage rate per the Product Data Sheet. Allow a minimum of 2 hours prior to the application of subsequent coats.
- C. Apply a second continuous and uniform coat over the entire area moving in one direction, at a coverage rate per the Product Data Sheet.
- D. Apply coating in a 'wet on wet' fashion over entire work area. Discontinue applications at predetermined points such as an edge, corner, or joint. Apply the topcoat at a 45-degree angle to edges, corners, or joints.
- E. For existing coated substrates apply 1 coat of acrylic coating primer and surface conditioner by brush, roller, or spray at a rate not to exceed 300 sq. ft. per gallon prior to application of the anti-carbonation coating.
- F. Adhere to all limitations and cautions for the polymer-modified cement coating in the manufacturer's printed literature.

### 3.08 APPLICATION OF SEALANTS

- A. Provide the approved sealant system where shown on the Drawings, and in strict accord with the manufacturer's recommendations as approved by the Architect.
- B. Install sealants immediately after joint preparation. Mix and apply multi-component sealants in accord with manufacturer's printed instructions.
- C. Install sealants to fill joints completely from the back, without voids or entrapped air, using proven techniques, proper nozzles and sufficient force that result in sealants directly contacting and fully wetting joint surfaces.
- D. Install sealants to uniform cross-sectional shapes with depths relative to joint widths that allow optimum sealant movement capability as recommended by sealant manufacturer.

- E. Tool sealants in manner that forces sealant against back of joint, ensures firm, full contact at joint interfaces and leaves a finish that is smooth, uniform and free of ridges, wrinkles, sags, air pockets and embedded impurities.
- F. Remove sealant from adjacent surfaces in accord with sealant and substrate manufacturer recommendations as work progresses.
- G. Protect joint sealants from contact with contaminating substances and from damages. Cut out, remove and replace contaminated or damaged sealants immediately, so that they are without contamination or damage at time of substantial completion.

### 3.09 FIELD QUALITY CONTROL

- A. Notify Architect when sections of work are complete to allow review prior to covering completed Work.
- B. Cooperate with Owner's inspection agency as applicable, who will observe substrate and coating installation and provide written documentation of observations.

### 3.10 CLEANING

- A. Remove uncured materials from tools or other surfaces with an approved solvent. Remove cured materials can by mechanical means.
- B. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.

### 3.11 PROTECTION

- A. Cap and protect exposed back-up walls against moisture and wet weather conditions during and after application of membrane. Protect uncured Work against wet weather conditions for a minimum of 24 hours. Protect waterproof protective coating from damage and inclement weather during the construction phase.

**END OF SECTION 09965**

## **SECTION 10426 - SPECIALTY SIGNAGE**

### **PART 1 - GENERAL**

#### **1.01 WORK INCLUDED:**

- A. Comply with requirements of the Contract Documents and all applicable codes and regulations to provide exterior signs and related accessories, in the types and arrangements shown on the Drawings, as specified herein and as needed for a complete and proper installation.

#### **1.02 RELATED WORK:**

- A. Comply with the relative requirements of other Divisions, Sections, the General and Supplementary Conditions and the Drawings of the entire Contract Documents. The breakdown of this project manual into Divisions and Sections shall not define any limit of work.

#### **1.03 SHOP DRAWINGS SUBMITTALS:**

- A. Submit in accordance with Section 01300. Submit manufacturer's letter layout and installation instructions. Provide pounce pattern for installation to Contractor.

#### **1.04 HANDLING:**

- A. Deliver all products to job site in manufacturer's unopened containers.

#### **1.05 WARRANTY:**

- A. Workmanship and materials shall be free from defect. Upon written notice by Owner, at Contractor's expense, make necessary repairs or replacement of defective work and materials, for a period of one (1) year.

### **PART 2 - PRODUCTS**

#### **2.01 INTERIOR SIGNAGE (BEST SIGN SYSTEMS):**

- A. Provide HC 300 ADA Sign System Plastic Signs, 5/8" Standard Bold Condensed Copy, 1/32" raised letters, braille, 3/8" radiused corners, and vinyl foam tape mounting. Provide signs in styles and quantities listed below:
  1. HC 300 F, 6" x 6" Room Name - 11 Signs
  2. EXIT – Low Level Standard Exit Signs – 4 Signs

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION AND CLEANING:**

- A. Contractor shall install, in location as designated by Architect, in strict accordance with manufacturer's instructions. Upon completion, signs shall be thoroughly cleaned.

**END OF SECTION 10426**

## 10522 - FIRE EXTINGUISHERS & CABINETS

### PART 1 - GENERAL

#### 1.01 WORK INCLUDED:

- A. Comply with requirements of the Contract Documents and all applicable codes and regulations to provide fire extinguishers and cabinets and related accessories, in the types and arrangements shown on the Drawings, as specified herein and as needed for a complete and proper installation.

#### 1.02 RELATED WORK:

- A. Comply with the relative requirements of other Divisions, Sections, the General and Supplementary Conditions and the Drawings of the entire Contract Documents. The breakdown of this project manual into Divisions and Sections shall not define any limit of work.

#### 1.03 PRODUCT DATA SUBMITTALS:

- A. Submit in accordance with Section 01300. Submit manufacturer's product data and installation instructions.

#### 1.04 HANDLING:

- A. Deliver all products to job site in manufacturer's unopened containers.

#### 1.05 WARRANTY:

- A. Workmanship and materials shall be free from defect. Upon written notice by Owner, at Contractor's expense, make necessary repairs or replacement of defective work and materials, for a period of one (1) year.

### PART 2 - PRODUCTS

#### 2.01 FIRE EXTINGUISHERS:

- A. Standard Fire Extinguisher: Provide Fire Extinguishers as scheduled from J.L. Industries, Larsen or approved equal. Provide, with each cabinet, one (1) 5#, 2A-10B:C UL rated fire extinguisher where scheduled. Provide standard wall mounted bracket where scheduled in lieu of in cabinet.

#### 2.02 FIRE EXTINGUISHER CABINET:

- A. Semi-Recessed Cabinet: J. L. Industries, Panorama 1027; Larsen, AL-G 2409-6R; or approved equal. Provide number as scheduled on Drawings. Mounting height, 6'-0" to top from finished floor.
  - 1. Surface-Mounted Cabinet: (if applicable): J. L. Industries, Panorama 1023; Larsen, AL-G 2409 SM; or approved equal. Provide number as scheduled on Drawings.

**PART 3 - EXECUTION**

3.01 INSTALLATION AND CLEANING:

- A. In strict accordance with manufacturer's instructions. Upon completion, equipment shall be thoroughly cleaned. Install in location shown or consult Architect.

**END OF SECTION 10522**

## **SECTION 10800 TOILET AND BATH ACCESSORIES**

### **PART 1 - GENERAL**

#### 1.01 WORK INCLUDED:

- A. Comply with requirements of the Contract Documents and all applicable codes and regulations to provide toilet and bath accessories and related accessories, in the types and arrangements shown on the Drawings, as specified herein and as needed for a complete and proper installation.

#### 1.02 RELATED WORK:

- A. Comply with the relative requirements of other Divisions, Sections, the General and Supplementary Conditions and the Drawings of the entire Contract Documents. The breakdown of this project manual into Divisions and Sections shall not define any limit of work.

#### 1.03 QUALITY ASSURANCE:

- A. Comply with manufacturer's instructions.

#### 1.04 PRODUCT DATA SUBMITTALS:

- A. Submit in accordance with Section 01300. Submit manufacturer's product data and installation instructions.

#### 1.05 PRODUCT HANDLING:

- A. Deliver all products to job site in manufacturer's unopened containers.

#### 1.06 WARRANTY:

- A. Workmanship and materials shall be free from defect. Upon written notice by Owner, at Contractor's expense, make necessary repairs or replacement of defective work and materials, for a period of one (1) year.

### **PART 2 - PRODUCTS**

#### 2.01 SOAP DISPENSER:

- A. Bobrick, B-4112; or approved equal (2 each).

#### 2.02 PAPER TOWEL DISPENSER:

- A. Bobrick, B-262; or approved equal (2 each).

2.03 TOILET PAPER HOLDER:

A. Bobrick, B-4388, or approved equal (2 each).

2.04 COAT HOOK:

A. Bobrick, B-233; or approved equal (2 each).

2.05 WALL MIRROR:

A. Bobrick, 165-18x36; or approved equal (2 each).

2.07 MOP AND BROOM HOLDER:

A. Bobrick, B-223x24; or approved equal (1 each).

**PART 3 - EXECUTION**

3.01 INSTALLATION AND CLEANING:

- A. In strict accordance with manufacturer's instructions. Upon completion, equipment shall be thoroughly cleaned. Install in location shown or consult Architect.
- B. Refer to Architect for locations.

**END OF SECTION 10800**

## Section 15000 – Plumbing General Provisions

### PART 1 GENERAL

#### 1.1 SUMMARY

- A. The General Conditions of the Architectural Specifications, along with the supplementary conditions, special conditions, information to bidders, and any other pertinent information and documents shall apply the same as if repeated herein.



#### 1.2 SCOPE OF WORK

- A. Furnish all labor and material necessary to provide and install the complete mechanical portion of this Contract, including plumbing systems as called for herein and on accompanying drawings. Parts of the mechanical division may be bid separately or in combination, at the Contractor's option; however, it shall be the responsibility of the General Contractor to assure himself that all items covered in the this Division 01 have been included if he chooses to accept separate bids.
- B. This Contractor shall refer to the Architectural and Structural drawings and install equipment, piping, etc. to meet building and space requirements. No equipment shall be bid on or submitted for approval if it will not fit in the space provided.
- C. It is the intention of these Specifications that all mechanical systems shall be furnished complete with all necessary valves, controls, insulation, piping, devices, equipment, etc. necessary to provide a satisfactory installation in working order.
- D. Contractor shall visit the site and acquaint himself thoroughly with all existing facilities and conditions which would affect his portion of the work. Failure to do so shall not relieve the Contractor from the responsibility of installing his work to meet the conditions.

This Contractor shall protect the entire system and all parts thereof from injury throughout the project and up to acceptance of the work. Failure to do so shall be sufficient cause for the Architect to reject any piece of equipment.

#### 1.3 DEMOLITION

- A. The contractor shall visit the site prior to bid to determine the extent of work required to complete the project.
- B. Contractor shall coordinate demolition with owner. The Owner shall have "First Right of Refusal" regarding salvage of all equipment and materials to be removed. Locate equipment as directed by owner. All equipment and materials not salvaged by the owner shall be removed from the site and discarded at the contractor's expense.
- C. Contractor shall coordinate all work with general contractor and phase work as required by project.
- D. All equipment piping, etc. required to be removed to accommodate the modifications shall be removed.



- E. Contractor shall maintain services to existing facilities which shall remain during and after construction is complete.
- F. Contractor shall coordinate any shutdown of services with the owner. It is intended that the building will remain occupied during construction. Contractor shall schedule shut down of services with the owner in order to prevent disruption of building occupancy.
- G. Contractor shall be responsible for draining down of existing systems to complete demolition. All work shall be scheduled with the owner. Contractor shall also be responsible for refilling system and removing all air in order to return the systems to proper operating conditions.
- H. All shut down of services shall be done at night or during a time period approved by the owner. The systems shall be required to be back up and running each morning unless otherwise approved by the owner.

#### 1.4 GROUNDS AND CHASES

- A. This Contractor shall see that all required chases, grounds, holes and accessories necessary for the installation of his work are properly built in as the work progresses; otherwise, he shall bear the cost of providing them.

#### 1.5 CUTTING AND PATCHING

- A. Initial cutting and patching shall be the responsibility of the General Contractor, with the Mechanical Contractor being responsible for laying out and marking any and all holes required for the reception of his work. No structural beams or joists shall be cut or thimble without first receiving the approval of the Architect. After initial surfacing has been done, any further cutting, patching and painting shall be done at this Contractor's expense.

#### 1.6 FILL AND CHARGES FOR EQUIPMENT

- A. Fill and charge with materials or chemicals all those devices or equipment as required to comply with the manufacturer's guarantee or as required for proper operation of the equipment.

#### 1.7 MACHINERY GUARDS

- A. This Contractor shall provide v-belt guards for each v-belt drive or other hazardous drive. The guard shall enclose the drive entirely and shall have a hole for taking a tachometer reading.
- B. Provide protective guard for belts, pulleys, gears, couplings, projecting set screws, keys and other rotating parts which are located such that a person might come in close proximity. Construct protective guard around angle iron frame, securely bolted to apparatus; comply with safety requirements. Install guard to completely enclose drives and pulleys and not interfere with lubrication of equipment. Provide 2 inch minimum diameter opening in fan belt guards housing for tachometer.

#### 1.8 REPAIRING ROADWAYS AND WALKS

- A. Where this Contractor cuts or breaks roadways or walks, in order to lay piping, he shall repair or replace these sections to meet the Architect's approval.

## 1.9 EXCAVATION AND BACKFILL

- A. Contractor shall perform all excavating necessary to lay the specified services. Perform excavation of every description and of whatever substance encountered to depths indicated or specified. Pile materials suitable for backfilling a sufficient distance from banks of trenches to prevent slides or cave-ins. Comply with OSHA requirements for excavation, trenching and shoring. Waste excavation materials, rubbish, etc. shall be carted away from the premises, as indicated. Remove water from trenches by pumping or other approved method, discharge at a safe distance from the excavation.
- B. Provide trenches of necessary width for proper laying of pipe and comply with latest publication of OSHA 2226 Excavating and Trenching Operations. Coordinate trench excavation with pipe installation to avoid open trenches for prolonged periods. Accurately grade bottoms of trenches to provide uniform bearing and support for each section of pipe on undisturbed soil or the required thickness of bedding material at every point along its entire length.
- C. Provide minimum 12 inches between outer surfaces and embankment or shoring, which may be used, when excavating for manholes and similar structures. Remove unstable soil that is incapable of supporting the structure in the bottom of the excavation to the depth necessary to obtain design bearing.
- D. Material to be excavated is "unclassified". No adjustment in the contract price will be made on account of the presence or absence of rock, shale, masonry, or other materials.
- E. Protect existing utility lines that are indicated or the locations of which are made known prior to excavating and trenching and that are to be retained. Protect utility lines encountered during excavating and trenching operations, from damage during excavating, trenching and backfilling; if damaged, repair lines as directed by utilities, owner and A/E. Issue notices when utility lines that are to be removed are encountered within the area of operations in ample time for the necessary measures to be taken to prevent interruption of the service.
- F. Provide trenches for utilities of a depth that will provide the following minimum depths of cover from existing grade or from indicated finished grades, or depths of cover in accordance with the manufacturer's recommendations, whichever is lower:
  - 1. 1-Foot Minimum Cover: Sanitary sewer, storm drainage, industrial waste, acid waste.
  - 2. 3-Feet Minimum Cover: Domestic water, fire line.
- G. Underground domestic water piping and fire line piping shall have a 6" bed of sand below the piping and backfilled with sand to 6" above the top of piping. Select fill may be used above the sand layer.
- H. Backfill trenches after piping, fittings and joints have been tested and approved. Backfill trenches with sand to provide 6 inches of sand below piping and 12 inches of sand cover above piping.
- I. Backfill remainder of trenches with satisfactory material consisting of earth, loam, sandy clay, sand and gravel or soft shale, free from large clods of earth and stones not over 1-1/2 inches in size. Deposit backfill material in 9 inch maximum layers, loose depth as indicated or as specified. Take care not to damage utility lines.
- J. Deposit the remainder of backfill materials in the trench in 1 foot maximum layers and compact by mechanical means. Refer to architectural for minimum density for compaction (Minimum 85 percent of maximum soil density as determined by ASTM D 698). Re-open trenches and excavation pits improperly backfilled or where settlement occurs to the depth required to obtain the specified compaction, the refill and compact with the surface restored to the required grade and compaction.

- K. Backfill utility line trench with backfill material, in 6 inch layers, where trenches cross streets, driveways, building slabs, or other pavement. Moisten each layer and compact to 95 percent of the maximum soil density as determined by ASTM D 698. Accomplish backfilling in such a manner as to permit the rolling and compaction of the filled trench with the adjoining material to provide the required bearing value so that paving of the area can proceed immediately after backfilling is complete.

#### 1.10 NOISE AND VIBRATION

- A. Provide the plumbing system and its associated components, items, piping, and equipment free of objectionable vibration or noise. Statically and dynamically balance rotating equipment and mount or fasten so that no vibration is transmitted to or through the building structure by equipment, piping, ducts or other parts of work, rectify such conditions at no additional compensation.

#### 1.11 PAINTING

- A. All painting shall be by the General Contractor's Painting Sub-Contractor. All pipe, pipe covering, equipment, supports, hangers, etc. exposed in the building or equipment room shall be painted. This Contractor shall prepare the surface of the material to receive the first coat of paint.
- B. All subsequent coatings shall be prepared by the Painting Sub-Contractor. Requirements covering paints, workmanship and preparation of surfaces as stated in the Architectural Specifications shall govern. Colors shall be approved by the Architect. All piping shall be color-coded.
- C. All piping shall be color coded per the following:
  - 1. Natural Gas Piping (Exposed in Mechanical Room) Yellow
  - 2. Natural Gas Piping (Outdoor, Roof, Exterior of Building) Yellow
  - 3. Natural Gas Piping (Exposed in Building) Black
  - 4. Storm Drain Piping (Exposed in Building) Black
  - 5. Sanitary Sewer Waste & Vent (Exposed in Building) Black
    - a. Thermoplastic pipe and fittings shall be painted using latex(water base) paint .
    - b. Pipe should be cleaning to remove moisture, dirt and oil; then wiped with a clean, dry cloth.
    - c. Do not use petroleum based paints.

#### 1.12 CLEANING AND ADJUSTING

- A. Upon completion of his work, the Contractor shall clean and adjust all equipment, controls, valves, etc.; clean all piping, ductwork, etc.; and leave the entire installation in good working order.

#### 1.13 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Provide the Owner with three (3) copies of printed instructions indicating various pieces of equipment by name and model number, complete with parts lists, maintenance and repair instructions and test and balance report.
- B. COPIES OF SHOP DRAWINGS WILL NOT BE ACCEPTABLE AS OPERATION AND MAINTENANCE INSTRUCTIONS BUT MUST BE INCLUDED IN SUBMITTAL PACKAGE.
- C. This information shall be bound in plastic hardbound notebooks with the job name permanently embossed on the cover. Rigid board dividers with labeled tabs shall be provided for different pieces of equipment. Submit manuals to the Architect for approval.

- D. In addition to the operation and maintenance brochure, the Contractor shall provide a separate brochure which shall include registered warranty certificates on all equipment, especially any pieces of equipment which carry warranties exceeding one (1) year.
- E. The operation and maintenance brochure shall be furnished with a detailed list of all equipment furnished to the project, including the serial number and all pertinent nameplate data such as voltage, amperage draw, recommended fuse size, rpm, etc. The Contractor shall include this data on each piece of equipment furnished under this contract.

#### 1.14 GUARANTEE

- A. The Contractor shall guarantee all materials, equipment and workmanship for a period of one (1) year from the date of final acceptance of the project. This guarantee shall include furnishing of all labor and material necessary to make any repairs, adjustments or replacement of any equipment, parts, etc. necessary to restore the project to first class condition. This guarantee shall exclude only the changing or cleaning of filters. Warranties exceeding one (1) year are hereinafter specified with individual pieces of equipment.

#### 1.15 LOCAL CONDITIONS

- A. The location and elevation of all utility services is based on available surveys and utility maps and are reasonably accurate; however, these shall serve as a general guide only, and the Contractor shall visit the site and verify the location and elevation of all services to his satisfaction in order to determine the amount of work required for the execution of the Contract.
- B. The Contractor shall contact the various utility companies, determine the extent of their requirements and he shall include in his bid all lawful fees and payments required by these companies for complete connection and services to the building, including meters, connection charges, street patching, extensions from meters to main, etc.
- C. In case major changes are required, this fact, together with the reasons therefor, shall be submitted to the Architect, in writing, not less than seven (7) days before the date of bidding. Failure to comply with this requirement will make the Contractor liable for any changes, additions and expenses necessary for the successful completion of the project.

#### 1.16 PERMITS, INSPECTIONS AND TESTS

- A. All permits, fees, etc. for the installation, inspections, plan review, service connections locations, and/or construction of the work which are required by any authority and/or agencies having jurisdiction, shall be obtained and paid for by the Contractor. This shall be verified during the bidding process.
- B. The Contractor shall make all tests required by the Architect, Engineer or other governing authorities at no additional cost to the Owner.
- C. The Contractor shall notify the Architect and local governing authorities before any tests are made, and the tests are not to be drawn off a line covered or insulated until examined and approved by the authorities. In event defects are found, these shall be corrected and the work shall be retested.
- D. Prior to requesting final inspection by the Architect, the Contractor shall have a complete coordination and adjustment meeting of all of his sub-contractors directly responsible for the operation of any

portion of the system. At the time of this meeting, each and every sequence of operation shall be checked to assure proper operation. Notify the Architect in writing ten (10) days prior to this meeting, instructing him of the time, date and whom you are requesting to be present.

- E. This project shall not be accepted until the above provisions are met to the satisfaction of the Architect.

#### 1.17 CODES AND STANDARDS

- A. The entire mechanical work shall comply with the rules and regulations of the City, Parish, County and the State in which this project is being constructed, including the State Fire Marshal and the State Department of Health. Modifications required by these authorities shall be made without additional charge to the Owners. The Contractor shall report these modifications to the Architect and secure his approval before work is started.

- B. In addition to the codes heretofore mentioned, mechanical work and equipment shall conform to the applicable portions of the following specifications, codes and/or regulations:

1. American Society of Heating, Refrigeration and
2. Air Conditioning Engineers (ASHRAE)
3. National Electrical Code (NEC)
4. National Fire Protection Association (NFPA)
5. American Society of Mechanical Engineers (ASME)
6. American Gas Association (AGA)
7. International Building Code (IBC)
8. International Mechanical Code (IMC)
9. International Plumbing Code (IPC)
10. International Fuel Gas Code (IFGC)
11. Underwriters Laboratories (UL)
12. Life Safety Code (NFPA 101)
13. State Sanitary Code
14. Louisiana State Uniform Construction Code Council (LSUCCC)
15. Facility Guidelines Institute "Guidelines for Design and Construction of Hospitals and Outpatient Facilities" (2014 Edition)

- C. Materials, equipment and accessories installed under this Contract shall conform to the rules, codes, etc. as recommended by National Associations governing the manufacturer, rating and testing of such materials, equipment and accessories. Materials shall be new and of the best quality and first class in every respect. Whenever directed by the Architect, the Contractor shall submit a sample for approval before proceeding.
- D. Where laws or local regulations provide that certain accessories such as gauges, thermometers, relief valves and parts be installed on equipment, it shall be understood that such equipment be furnished complete with the necessary accessories, whether or not called for in these Specifications.
- E. Unfired pressure vessels shall be built in accordance with the A.S.M.E. Code and so stamped. Furnish shop certificates for each vessel.

#### 1.18 REVIEW OF MATERIALS

- A. Whenever manufacturers or trade names are mentioned in these Plans or Specifications, the words "or approved equivalent" shall be assumed to follow whether or not so stated. Manufacturers or trade

names are used to establish a standard of quality only, and should not be construed to infer a preference. Equivalent products which meet the Architect's approval will be accepted; however, these products must be submitted to the Architect a minimum of seven (7) days prior to the Bid Date.

- B. Submission shall include the manufacturer's name, model number, rating table and construction features.
- C. Upon receipt and checking of this submittal, the Architect will issue an addendum listing items which are approved as equivalent to those specified. **THE CONTRACTOR SHALL BASE HIS BID SOLELY ON THOSE ITEMS SPECIFIED OR INCLUDED IN THE "PRIOR APPROVAL ADDENDUM", AS NO OTHER ITEM WILL BE ACCEPTABLE.**
- D. Prior approval of a particular piece of equipment does not mean automatic final acceptance and will not relieve the Contractor of the responsibility of assuring himself that this equipment is in complete accord with the Plans and Specifications and that it will fit into the space provided. Shop drawings must be submitted on all items of equipment for approval as hereinafter specified.
- E. Before proceeding with work and/or within thirty (30) days after the award of the General Contract for this work, the Mechanical Contractor shall furnish to the Architect complete shop and working drawings of such apparatus, equipment, controls, insulation, etc. to be provided in this project. These drawings shall give dimensions, weights, mounting data, performance curves and other pertinent information.
- F. The Architect's approval of shop drawings shall not relieve the Contractor from the responsibility of incorrectly figured dimensions or any other errors which may be contained in these drawings. Any omission from the shop drawings or specifications, even though approved by the Architect, shall not relieve the Contractor from furnishing and erecting same.
- G. Six (6) sets of shop drawings shall be submitted to the Architect for approval. These submittals shall be supplied as part of this Contractor's contract. Any drawings not approved shall be resubmitted until they are approved.
- H. This information shall be bound in plastic hardbound notebooks with the job name permanently embossed on the cover. Rigid board dividers with labeled tabs shall be provided for different pieces of materials and equipment. Submit shop drawings to the Architect for approval. Faxed copies submissions will not be accepted.

#### 1.19 MINOR DEVIATIONS

- A. Plans and detail sketches are submitted to limit, explain and define conditions, specified requirements, pipe sizes and manner of erecting work. Structural or other conditions may require certain modifications from the manner of installation shown, and such deviations are permissible and shall be made as required. However, specified sizes and requirements necessary for satisfactory operation shall remain unchanged. It may be necessary to shift ducts or pipes, or to change the shape of ducts, and these changes shall be made as required. All such changes shall be referred to the Architect and Engineer for approval before proceeding. Extra charges shall not be allowed for these changes. The contractor shall obtain a full set of plans and specifications for the coordination of his work prior to bidding this project. Items which are unclear to the bidding contractor shall be brought to the Architect and Engineers attention prior to bidding the project. An interpretation shall be clarified by the Architect and/or the Engineer prior to bidding.
- B. The Contractor shall realize that the drawings could delve into every step, sequence or operation necessary for the completion of the project, without drawing on the Contractor's experience or ingenuity. However, only typical details are shown on the Plans. In cases where the Contractor is not

certain about the method of installation of his work, he shall ask for details. Lack of details will not be an excuse for improper installation.

- C. In general, the drawings are diagrammatic and the Contractor shall install his work in a manner so that interferences between the various trades are avoided. In cases where interferences do occur, the Architect is to state which item was first installed.

#### 1.20 AS-BUILT RECORD DRAWINGS

- A. The Contractor shall obtain at his cost, two sets of blue line prints of the original bid documents by the Architect. One set shall be kept on the site with all information as referenced below, and shall update same as the work progresses. The other set will be utilized to record all field changes to a permanent record copy for the Owner.
- B. If the Contractor elects to vary from the Contract Documents and secures prior approval from the Architect for any phase of the work, he shall record in a neat and readable manner, ALL such variances on the blackline print in red. The original blackline prints shall be returned to the Architect for documentation.
- C. All deviations from sizes, locations, and from all other features of the installations shown in the Contract Documents shall be recorded.
- D. In addition, it shall be possible using these drawings to correctly and easily locate, identify and establish sizes of all piping, directions and the like, as well as other features of the work which will be concealed underground and/or in the finished building.
- E. Locations of underground work shall be established by dimensions to columns, lines or walls, locating all turns, etc., and by properly referenced centerline or invert elevations and rates of fall.
- F. For work concealed in the building, sufficient information shall be given so it can be located with reasonable accuracy and ease. In some cases this may be by dimension. In others, it may be sufficient to illustrate the work on the drawings in relation to the spaces in the building near which it was actually installed. The Architect's/Engineer's decision in this matter will be final.
- G. The following requirements apply to all "As-Built" drawings:
  - 1. They shall be maintained at the Contractor's expense.
  - 2. All such drawings shall be done carefully and neatly, and in a form approved by the Architect/Engineer.
  - 3. Additional drawings shall be provided as necessary for clarifications.
  - 4. These drawings shall be kept up-to-date during the entire course of the work and shall be available upon request for examination by the Architect/Engineer; and when necessary, to establish clearances for other parts of the work.
  - 5. "As-built" drawings shall be returned to the Architect upon completion of the work and are subject to approval of the Architect/Engineer.

#### 1.21 REQUIRED SHOP DRAWING SUBMITTALS

- A. Provide the following shop drawing submittals:
  - 1. Pipe insulation.
  - 2. All Valves.

3. Plumbing fixtures and trim.
4. Pipe and pipe fittings.
5. PVC jacket color samples.
6. Water Heaters.
7. Mixing Valves.
8. Acid waste piping and fittings.
9. Pumps.

## PART 2 PRODUCTS

### 2.1 PLUMBING PRODUCTS

- A. Refer to individual Division 15 sections for plumbing products, pipe, tube and fitting materials and joining methods.

## PART 3 EXECUTION

### 3.1 MANUFACTURER'S DIRECTION

- A. The contractor shall install and operate equipment and material in accordance with the manufacturer's installation and operating instructions. The manufacturer's instructions of installation and operation shall become part of the Contract Documents and shall supplement the Drawings and Specifications.
- B. Store equipment in a clean, dry place protected from other construction. While stored, maintain factory wrapping or tightly cover and protect equipment against dirt, water, construction debris, chemical, physical or weather damage, traffic and theft.

### 3.2 EQUIPMENT LABELS

- A. Provide equipment labels for water heaters and mixing valves. Labels shall have permanent laminated construction secured to equipment.

### 3.3 PIPE LABELS

- A. Provide pipe markers and directional arrows on all piping in mechanical equipment rooms, or which is exposed in building, and on both sides of all valves located above ceiling. Markers shall be as manufactured by W.H. Bradley Co., Marking Services Inc. or the equivalent. All letters shall be color-coded and sized as recommended by OSHA. Samples of the type of letters to be used shall be submitted with shop drawings. Piping shall be color-coded.
- B. Pipe markers with arrows shall indicate lines content and shall be located 20 feet on center and at each change of direction of line. Identification bands shall be color coded to match pipe markers and shall be provided 10 feet on center. Pipe identification markers shall be taped at each end and shall be taped around the entire circumference of pipe.
- C. The following Piping shall be identified:
  1. Domestic Cold Water



2. Domestic Hot Water
3. Sanitary Sewer
4. Sanitary Vent
5. Condensate Drain
6. Condensate Return

### 3.4 VALVE TAGS

- A. Secure metal tags to all valves. Labeling on all valve tags shall include type of system the valve controls and the area of building, zone, or equipment number affected by valve operation. Tag shall be 2" minimum diameter brass, engraved with code number, service and size. A framed list of the valves, giving manufacturer's name, model number, type and location shall be mounted in the main equipment room.

### 3.5 ACCESS DOORS:

- A. Provide access doors in walls, floors and ceilings to permit access to equipment and piping requiring service or adjustment.
  1. Valves.
  2. Plumbing drainage cleanouts.
  3. Other Plumbing equipment indicated in schedules or specifications which are requiring maintenance, adjustment or operation.
- B. Provide hinged access doors and frames as follows:
  1. Drywall Construction:
    - a. Provide with concealed spring hinges and flush screwdriver operated cam locks in sufficient number of the size of the panel.
    - b. Provide prime paintable surface (not galvanized).
    - c. Product: Milcor "Style M" (Karp DSC-214M).
  2. Visible Masonry and Ceramic Tile:
    - a. Milcor "Style M" (Karp DSC-214M).
  3. Cement Plaster:
    - a. Milcor "Style K" (Karp DSC-214 PL).
  4. Acoustical Plaster:

- a. Reinforced panel as required to prevent sagging. Provide continuous steel piano type hinge for the length of the panel, and sufficient number for the size of the panel. Provide factory prime paint surface (not galvanized).
  - b. Product: Milcor "Style AP" (Karp 214 PL).
5. Acoustical Tile:
- a. Milcor "Style AT" (Larsen L-CPA).
- C. Provide continuous concealed hinges and cam locks.
- D. Provide UL listed 1-1/2 hour label "B" access doors with automatic self-closing latching mechanism where required.
- E. Provide removable ceiling access tile section immediately adjacent to each mechanical or electrical device located in the ceiling plenum above removable tile ceiling.
- F. Coordinate approval of type, color and location of access doors & frames with Architect.

### 3.6 CLEANING AND SERVICE

- A. Upon Completion of this work, the contractor shall clean and adjust equipment, controls, valves, etc.;
- B. Clean piping, fixtures, cleanout covers, floor drain covers, etc. and leave the entire installation in good working order.
- C. Adjust flush valves and faucets to allow for proper operation.

END OF SECTION 15000

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# Section 15010 – General Duty Valves for Plumbing

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. Section Includes the furnishing and installation of general duty valves for plumbing:

### 1.3 DEFINITIONS

- A. CWP: Cold working pressure.

### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
  - 1. Certification that products comply with NSF 61 Annex G and NSF 372 (lead free).

### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, and soldered ends.
  - 3. Set ball valves open to minimize exposure of functional surfaces.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection.
  - 2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
  - 1. ASME B1.20.1 for threads for threaded end valves.
  - 2. ASME B16.1 for flanges on iron valves.
  - 3. ASME B16.5 for flanges on steel valves.
  - 4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
  - 5. ASME B16.18 for solder-joint connections.

- 6. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Actuator Types:
  - 1. Gear Actuator: For quarter-turn valves NPS 4 and larger.
  - 2. Hand lever: For quarter-turn valves smaller than NPS 4.
- H. Valves in Insulated Piping:
  - 1. Include 2-inch stem extensions.
  - 2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
  - 3. Memory stops that are fully adjustable after insulation is applied.

## 2.2 MANUFACTURERS

- A. Valves shall be manufactured by one of the following:
  - 1. Kitz.
  - 2. Red & White.
  - 3. Nibco.
  - 4. Kennedy.
  - 5. Crane.
  - 6. Milwaukee.
  - 7. Keystone.
  - 8. Stockham.
  - 9. Grinnell.
  - 10. Mueller.
  - 11. Jamesbury.
  - 12. DeZurik.
  - 13. Hammond.
  - 14. Apollo.

## 2.3 BRONZE BALL VALVES

- A. Two-Piece, Bronze Ball Valves with Full Port and Brass Trim:
  - 1. Kitz 59/69, Apollo 77C, NIBCO Design S-580-70, Milwaukee BA-150-S, Red & White 5049F or equal, threaded ends of heating hot water and low pressure steam of Kitz 58/68, Apollo 77CLF, NIBCO Design T-580-70, Milwaukee BA-100-S, Red & White 5044F or equal. For insulated piping systems, provide ball valves with extended stem, insulated handle with protective thermal barrier sleeve to prevent condensate moisture drip and pipe insulation deterioration.
  - 2.
  - 3. Description:
    - a. Standard: MSS SP-110.
    - b. CWP Rating: 600 psig.
    - c. SSP Rating: 150 psi.

- d. Body Design: Two piece.
- e. Body Material: Bronze.
- f. Ends: Threaded and soldered.
- g. Seats: PTFE.
- h. Stem: Brass. Blow-out proof.
- i. Ball: Chrome-plated brass.
- j. Port: Full.
- k. Vinyl covered steel handle.
- l. Lead Free.
- m. Conforms to ASTM B-62.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

### 3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown. Unions are not required on flanged devices.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install valve tags.
- F. All valves, unions, etc. where pipe is chrome plated shall have similar finish. All exposed supplies to plumbing fixtures shall be chrome plated.

### 3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- B. All gas cocks, valves, etc. on gas lines shall have local utility company and AGA approval.

- C. Select valves with the following end connections:
1. For Copper Tubing, NPS 2 and Smaller: Solder ends, except provide threaded ends for heating hot water.
  2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
  3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
  4. For Steel Piping, NPS 2 and Smaller: Threaded ends or grooved ends.
  5. For Steel Piping, NPS 2-1/2 to NPS 4: Grooved end or Flanged ends except where threaded valve-end option is indicated in valve schedules below.
  6. For Steel Piping, NPS 5 and Larger: Grooved end or Flanged ends.

### 3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 3 and Smaller (above grade):
1. Two-piece, bronze ball valves with full port and brass trim.

END OF SECTION 15010

## Section 15020 - Plumbing Piping Insulation

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes insulating the following plumbing piping services:
  1. Domestic cold-water piping.
  2. Domestic hot-water piping.
  3. Sanitary drain piping receiving condensate.
  4. Supplies and drains for handicap-accessible lavatories and sinks.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated and for each application. Include thermal conductivity, water-vapor permeance, thickness, and jackets (both factory- and field-applied, if any).

#### 1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
  1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
  2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- B. Comply with the following applicable standards and other requirements specified for miscellaneous components:
  1. Supply and Drain Protective Shielding Guards: ICC A117.1.

#### 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.
- B. Reject damaged, deteriorated, wet, or contaminated material and immediately remove from the site. Replace removed materials at no additional cost to Owner.



## 1.6 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields.
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

## 1.7 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Insulation:
  - 1. Pittsburgh-Corning.
  - 2. Owens- Corning.
  - 3. Certainteed.
  - 4. Armacell.
  - 5. Rubatex.
  - 6. Knauf.
  - 7. Johns Manville.
- B. Jacketing:
  - 1. Ceel-Co.
  - 2. O'Brien.
  - 3. Zeston.
  - 4. Childers.
  - 5. Pabco.
- C. Adhesives:
  - 1. Benjamin Foster.
  - 2. Childers.
  - 3. Vimasco.
  - 4. B.E.H.

### 2.2 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
  - 1. Density of 5.0 lbs/cubic foot.
  - 2. K factor of 0.27 at 75 degrees F mean.
  - 3. Maximum water vapor transmission of 0.17 per inch.
  - 4. Must be listed for 25/50 flame/smoke spread of thickness used.
- G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- H. Mineral-Fiber, Preformed Pipe Insulation: Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
  - 1. All-service jacket ASJ-SSL type factory applied jacketing.
  - 2. 6 lbs/cu ft minimum density.
  - 3. k-factor of 0.31 maximum at 200 degrees F mean.
  - 4. 850 degree F service temperature.
  - 5. 0.02 perm maximum Jacket permeance.

## 2.3 PIPE AND FITTING COVERS

- A. Polyvinyl Chloride (PVC) Covers:
  - 1. Ultraviolet resistant.
  - 2. 0.020 inch minimum thickness.
  - 3. Preformed to match outer diameter of insulation.
  - 4. Preformed fitting covers, minimum 10 mil.
- B. Aluminum (A) Covers:
  - 1. ASTM B209, Alloy 3003 minimum.
  - 2. 0.016-inch thickness.
  - 3. Bright anodized or acrylic-coated smooth finish on exposed side.
  - 4. 2-piece tee and ribless elbow covers in minimum 0.016-inch, preformed.
  - 5. Provide moisture barrier backing and butt-joint with mastic seal for joining of adjacent sections.

## 2.4 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.
  - 1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
  - 1. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
  - 1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. PVC Jacket Adhesive: Compatible with PVC jacket.
  - 1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## 2.5 MASTICS

- A. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.
  - 1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
  - 2. Service Temperature Range: 0 to 180 deg F.
  - 3. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
  - 4. Color: White.

## 2.6 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.
  - 1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
  - 3. Service Temperature Range: 0 to plus 180 deg F.
  - 4. Color: White.

## 2.7 SEALANTS

- A. Joint Sealants:
  - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
  - 2. Permanently flexible, elastomeric sealant.
  - 3. Service Temperature Range: Minus 100 to plus 300 deg F.
  - 4. Color: White or gray.
  - 5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
  - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
  - 2. Fire- and water-resistant, flexible, elastomeric sealant.
  - 3. Service Temperature Range: Minus 40 to plus 250 deg F.
  - 4. Color: White.
  - 5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

6. Sealants 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."

## 2.8 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
  1. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

## 2.9 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
  1. Width: 3 inches.
  2. Thickness: 11.5 mils.
  3. Adhesion: 90 ounces force/inch in width.
  4. Elongation: 2 percent.
  5. Tensile Strength: 40 lbf/inch in width.
  6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

## 2.10 SECUREMENTS

- A. Bands:
  1. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- C. Wire: 0.080-inch nickel-copper alloy.

## 2.11 PROTECTIVE SHIELDING GUARDS

1. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.
2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
  1. Verify that systems to be insulated have been tested and are free of defects.
  2. Verify that surfaces to be insulated are clean and dry.

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

### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

### 3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth.
  - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
  - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
    - a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
  5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
  2. Testing agency labels and stamps.
  3. Nameplates and data plates.
  4. Cleanouts.

### 3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
  2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
  4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
  2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
  4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistant joint sealers.
- F. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.

2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

### 3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
  1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
  2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
  3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
  4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
  5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
  6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
  7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
  8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
  9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
  1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
  2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on

- each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
  4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
  5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

### 3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
  1. Install pipe insulation to outer diameter of pipe flange.
  2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
  3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
  4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
  1. Install mitered sections of pipe insulation.
  2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
  1. Install preformed valve covers manufactured of same material as pipe insulation when available.
  2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
  3. Install insulation to flanges as specified for flange insulation application.
  4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

### 3.7 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
  1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
  2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
  3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
  4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.



- B. Insulation Installation on Pipe Flanges:
  - 1. Install preformed pipe insulation to outer diameter of pipe flange.
  - 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
  - 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
  - 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.
  
- C. Insulation Installation on Pipe Fittings and Elbows:
  - 1. Install preformed sections of same material as straight segments of pipe insulation when available.
  - 2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
  
- D. Insulation Installation on Valves and Pipe Specialties:
  - 1. Install preformed sections of same material as straight segments of pipe insulation when available.
  - 2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
  - 3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
  - 4. Install insulation to flanges as specified for flange insulation application.

### 3.8 FIELD-APPLIED JACKET INSTALLATION

- A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.
  - 1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
  - 2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
  - 3. Completely encapsulate insulation with coating, leaving no exposed insulation.
  
- B. Where FSK jackets are indicated, install as follows:
  - 1. Draw jacket material smooth and tight.
  - 2. Install lap or joint strips with same material as jacket.
  - 3. Secure jacket to insulation with manufacturer's recommended adhesive.
  - 4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
  - 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
  
- C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
  - 1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
  
- D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

### 3.9 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
  - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
    - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

### 3.10 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.
  - 2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

### 3.11 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Cold Water:
  - 1. Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
- B. Domestic Hot Water Mains:
  - 1. NPS 2 and Smaller: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
  - 2. NPS 2-1/2 and Larger: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.
- C. Domestic Hot Water Supply runouts (up to NPS 2 and not exceeding 12 feet in length from fixture shutoff valve back toward main line):
  - 1. NPS 2 and Smaller: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
- D. Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities (Handicapped Lavatory & Sinks P-Trap & Supply Lines):
  - 1. All Pipe Sizes: Insulation shall be the following:
    - a. Insulate p-trap, tailpiece and water supplies on handicapped lavatories with white, Truebro Model 102, Zurn 8947 handi lav-guard, or approved equivalent insulating system to meet A.D.A. Requirements. Provide accessories for offset tailpiece as required.

- E. Floor Drains, Traps, and aboveground Sanitary Drain Piping receiving HVAC condensate:
  - 1. All Pipe Sizes: Insulation shall be one of the following:
    - a. Flexible Elastomeric: 1/2 inch thick.
    - b. Mineral-Fiber, 3/4 lb density, ductwrap insulation with aluminum foil vapor barrier, Type I: 2 inch thick.
  
- F. Exposed Domestic Cold and Hot Water Piping.
  - 1. All exposed domestic cold and hot water piping shall also have field install PVC jacket.

END OF SECTION 15020

# Section 15110 - Domestic Water Piping

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. Section Includes:
  - 1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.
  - 2. Encasement for piping.

### 1.3 ACTION SUBMITTALS

- A. Product Data: For piping, transition fittings and dielectric fittings.

### 1.4 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

## PART 2 - PRODUCTS

### 2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

## 2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- C. Copper Unions:
  - 1. MSS SP-123.
  - 2. Cast-copper-alloy, hexagonal-stock body.
  - 3. Ball-and-socket, metal-to-metal seating surfaces.
  - 4. Lead free Solder-joint.

## 2.3 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials:
  - 1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
  - 2. Full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys.
- D. Flux: ASTM B 813, water flushable.
- E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

## 2.4 TRANSITION FITTINGS

- A. General Requirements:
  - 1. Same size as pipes to be joined.
  - 2. Pressure rating at least equal to pipes to be joined.
  - 3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

## 2.5 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. Standard: ASSE 1079.
  - 2. Pressure Rating: 150 psig.
  - 3. End Connections: Solder-joint copper alloy and threaded ferrous.

## PART 3 - EXECUTION

### 3.1 EARTHWORK

- A. Comply with requirements in Section 220000 "Plumbing General Provisions" for excavating, trenching, and backfilling.

### 3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance.
- D. Install shutoff valve immediately upstream of each dielectric fitting.
- E. Install domestic water piping level and plumb.
- F. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- G. 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.
- H. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- I. Install piping to permit valve servicing.

- J. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- K. Install piping free of sags and bends.
- L. Install fittings for changes in direction and branch connections.
- 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.
- P. Domestic cold water lines penetrating concrete slabs shall be wrapped with "Protect-O-Sleeve" vinyl flexible tube as manufactured by Robert H. Harris Co., Jones Stephen or equivalent.
- Q. Install piping in compliance with manufacturer's Commercial Piping Pocket Guide (2017).

### 3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Braze Joints" chapter.
- D. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

### 3.4 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
  - 1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
  - 2. Fittings for NPS 2 and Larger: Sleeve-type coupling.
- C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition unions.

### 3.5 HANGER AND SUPPORT INSTALLATION

- A. Provide pipe hangers and support products. Install as per the following:
  - 1. Vertical Piping: MSS Type 8 or 42, clamps.
  - 2. Individual, Straight, Horizontal Piping Runs:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
  - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support vertical piping and tubing at base and at each floor.
- C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
- D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
  - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
  - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
  - 4. NPS 2-1/2: 108 inches with 1/2-inch rod.
  - 5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
  - 6. NPS 6: 10 feet with 5/8-inch rod.
  - 7. NPS 8: 10 feet with 3/4-inch rod.
- E. Install supports for vertical copper tubing every 10 feet.
- F. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

### 3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.



- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
  - 1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
  - 2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
  - 3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

### 3.7 IDENTIFICATION

- A. Identify system components.

### 3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Piping Inspections:
    - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
    - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
      - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
      - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
    - c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
    - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
  - 2. Piping Tests:
    - a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
    - b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
    - c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
    - d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

- e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
  - f. Prepare reports for tests and for corrective action required.
- B. Domestic water piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

### 3.9 ADJUSTING

- A. Perform the following adjustments before operation:
1. Close drain valves, hydrants, and hose bibs.
  2. Open shutoff valves to fully open position.
  3. Open throttling valves to proper setting.
  4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
    - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
    - b. Adjust calibrated balancing valves to flows indicated.
  5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
  6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
  7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
  8. Check plumbing specialties and verify proper settings, adjustments, and operation.

### 3.10 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
  2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
    - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    - b. Fill and isolate system according to either of the following:
      - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of available chlorine. Isolate with valves and allow to stand for 24 hours (minimum time shall be 6 hours). A chlorine residual of at least 5 ppm should remain before the lines are put in use.

3. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
  - a. Repeat procedures if biological examination shows contamination.
  - b. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

### 3.11 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Underground piping up to 5'-0" from building, domestic cold water, building-service piping, NPS 4 and smaller, shall be the following:
  1. PVC, Schedule 40; socket fittings; and solvent-cemented joints.
- E. Aboveground domestic water piping, NPS 4 and smaller, shall be the following:
  1. Hard copper tube, ASTM B 88, Type L; copper, solder-joint fittings; and soldered joints.

### 3.12 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  1. Shutoff Duty: Use ball valves for piping NPS 3 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 4 and larger.
  2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
  3. Drain Duty: Hose-end drain valves.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 15110

## Section 15120 - Domestic Water Piping Specialties

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  1. Vacuum breakers.
  2. Water-hammer arresters.
  3. Escutcheons
  4. Trap-seal primer valves.

#### 1.3 ACTION SUBMITTALS

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

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

### PART 2 - PRODUCTS

#### 2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Potable-water piping and components shall comply with NSF 61 Annex G.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

## 2.3 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
  - 1. Standard: ASSE 1001.
  - 2. Size: NPS 1/4 to NPS 3, as required to match connected piping.
  - 3. Body: Bronze.
  - 4. Inlet and Outlet Connections: Threaded.
  - 5. Finish: Rough bronze.
  
- B. Hose-Connection Vacuum Breakers:
  - 1. Standard: ASSE 1011.
  - 2. Body: Bronze, non-removable, with manual drain.
  - 3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
  - 4. Finish: Chrome or nickel plated.

## 2.4 WATER-HAMMER ARRESTERS

- A. Water-Hammer Arresters:
  - 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.
  - 4. All water service to each plumbing fixture shall have an individual concealed air chamber. Air chambers shall be of the same diameter as the supply or header pipes and 12 inches long on both hot and cold water branches. Locate air chambers adjacent to each fixture or where a header is used, at the end of header piping for a group of fixtures.
  - 5. On lines 1-1/4" and above fixtures with quick closing valves (i.e.: Dishwashers, tempered valves, etc.) install "Shock Trol", "Precision Plumbing Products", Sioux Chief "Hydra-Rester", or equal water Hammer arrester properly sized for each unit.

## 2.5 ESCUTCHEONS

- A. Provide escutcheons for all exposed lines passing through floors, walls, and ceilings. They shall be chrome plated brass and shall be of such flange size as to cover necessary penetrating openings.

## 2.6 TRAP-SEAL PRIMER DEVICE

- A. Supply-Type, Trap-Seal Primer Device:
  - 1. Standard: ASSE 1018.
  - 2. Pressure Rating: 125 psig minimum.
  - 3. Body: Bronze.
  - 4. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
  - 5. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
  - 6. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.
  
- B. Drainage-Type, Trap-Seal Primer Device:
  - 1. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 minimum, trap makeup connection.
  - 2. Size: NPS 1-1/4 minimum.
  - 3. Material: Chrome-plated, cast brass.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install water-hammer arresters in water piping according to PDI-WH 201.
- B. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
- C. Install drainage-type, trap-seal primer valves as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.

END OF SECTION 15120

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# Section 15140 - Sanitary Waste and Vent Piping

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. Section Includes:
  - 1. Pipe, tube, and fittings.
  - 2. Specialty pipe fittings.

### 1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
  - 1. Soil, Waste, and Vent Piping: 10-foot head of water.

### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For solvent drainage system. Include plans, elevations, sections, and details.

### 1.5 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.
- B. Field quality-control reports.

### 1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.



## 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 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- B. Cellular-Core PVC Pipe shall not be acceptable.
- C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- 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).

### 2.3 EQUIPMENT DRAIN AND RELIEF LINES

- A. These shall be Government Type "L" hard copper.
- B. Provide air gap between the indirect waste and the building drainage system in accordance with International Plumbing Code (2015 Edition).

## PART 3 - EXECUTION

### 3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 220000 "Plumbing General Provisions."

### 3.2 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, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 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.
- K. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- L. Install soil and waste drainage and vent piping at the following minimum slopes in accordance with applicable codes.
- 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.

### 3.3 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hanger and support devices as per the ASHRAE Guidelines
  - 1.
  - 2. Install individual, straight, horizontal piping runs:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
  - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support horizontal piping and tubing within 12 inches of each fitting and coupling.
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

- E. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
  - 2. NPS 3: 48 inches with 1/2-inch rod.
  - 3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
  - 4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
  - 5. NPS 10 and NPS 12: 48 inches with 7/8-inch rod.
- F. Install supports for vertical PVC piping every 48 inches.
- G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.4 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 Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
  - 2. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.
- D. Connect force-main piping to the following:
  - 1. Sanitary Sewer: To exterior force main.
- E. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- F. Make connections according to the following unless otherwise indicated:
  - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
  - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
- G. Identify exposed sanitary waste and vent piping.

### 3.5 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.

### 3.6 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.

### 3.7 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Below grade & above grade, soil and waste piping NPS 6 and smaller shall be the following:
  1. Solid-wall Schedule 40, "DWV" PVC pipe, PVC socket fittings, and solvent-cemented joints.
- C. Below grade & above grade, vent piping NPS 4 and smaller shall be the following:
  1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

END OF SECTION 15140

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## Section 15150 - Sanitary Waste Piping Specialties

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  1. Roof flashing assemblies.
  2. Through-penetration firestop assemblies.
  3. Miscellaneous sanitary drainage piping specialties.
  4. Flashing materials.

#### 1.3 DEFINITIONS

- A. PVC: Polyvinyl chloride plastic.

#### 1.4 ACTION SUBMITTALS

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

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

### PART 2 - PRODUCTS

#### 2.1 HUB DRAIN (MARKED "HD"):

- A. Provide SureSeal Model SS2009V for 2" diameter condensate hub drains.

#### 2.2 TRAP PRIMER VALVE:

- A. Precision Plumbing Products Model P-1/P-2 (Mifab M-500), with air gap supply Precision Plumbing Products AG-500 (Mifab MI-GAP). Provide Precision Plumbing Products Distribution Unit (DU) (Mifab MI-DU) with proper number of branch lines as indicated on plans.

## 2.3 ROOF FLASHING ASSEMBLIES

### A. Roof Flashing Assemblies:

1. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch- thick, lead flashing collar and skirt extending at least 8 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
  - a. Open-Top Vent Cap: Without cap.

## 2.4 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

### A. Through-Penetration Firestop Assemblies:

1. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
2. Size: Same as connected soil, waste, or vent stack.
3. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
4. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
5. Special Coating: Corrosion resistant on interior of fittings.

## 2.5 FLASHING MATERIALS

- A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:
  1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
  2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
  3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.
- B. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.
- C. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.
- D. Fasteners: Metal compatible with material and substrate being fastened.
- E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.
- F. Solder: ASTM B 32, lead-free alloy.
- G. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
  1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
  2. Locate at each change in direction of piping greater than 45 degrees.

- B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- D. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.
- E. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
- F. Install deep-seal traps on floor drains and other waste outlets, if indicated.

### 3.2 FLASHING INSTALLATION

- A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
  - 1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
  - 2. Copper Sheets: Solder joints of copper sheets.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
  - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
  - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
  - 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.
- C. Set flashing on floors and roofs in solid coating of bituminous cement.
- D. Secure flashing into sleeve and specialty clamping ring or device.
- E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 076200 "Sheet Metal Flashing and Trim."
- F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.
- G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

### 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 15150



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## Section 15380 - Electric Domestic Water Heaters

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Commercial, electric, storage, domestic-water heaters.
  - 2. Electric, tankless, instantaneous domestic-water heaters.
  - 3. Domestic-water heater accessories.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of domestic-water heater indicated.
- B. Shop Drawings:
  - 1. Wiring Diagrams: For power, signal, and control wiring.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For electric, domestic-water heaters to include in emergency, operation, and maintenance manuals.

#### 1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.
- C. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects."

#### 1.6 COORDINATION

- A. Coordinate sizes and locations of framed stands / bases with actual equipment provided.

## PART 2 - PRODUCTS

- A. REFER TO WATER HEATER SCHEDULE FOR ADDITIONAL INFORMATION.

### 2.2 DOMESTIC-WATER HEATER ACCESSORIES

- A. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.
- B. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1.
- C. Heat-Trap Fittings: ASHRAE 90.2.
- D. Pressure-Reducing Valves: ASSE 1003 for water. Set at 50-psig- maximum outlet pressure unless otherwise indicated.
- E. Combination Temperature-and-Pressure Relief Valves: ASME rated and stamped. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.
- F. Pressure Relief Valves: ASME rated and stamped. Include pressure setting less than domestic-water heater working-pressure rating.
- G. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.
- H. Shock Absorbers: ASSE 1010 or PDI-WH 201, Size A water hammer arrester.
- I. Domestic-Water Heater Stands: Manufacturer's factory-fabricated steel stand for floor mounting, capable of supporting domestic-water heater and water. Include dimension that will support bottom of domestic-water heater a minimum of 18 inches above the floor.

## PART 3 - EXECUTION

### 3.1 CONNECTIONS

- A. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

### 3.2 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
  1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
  2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
  4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- B. Prepare test and inspection reports.

### 3.3 WATER HEATER BOILER INSPECTION

- A. Contractor shall install water heaters to conform to Louisiana Boiler Inspection Law. Contractor shall contact the State Fire Marshal Boiler Inspection Division (800-256-5452) to get a final inspection on all water heaters 50 gallon capacity or larger and / or 100,000 BTU/HR heat input or greater.

END OF SECTION 15380

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## Section 15400 - Plumbing Fixtures

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  1. Water closets.
  2. Flush valves.
  3. Toilet seats.
  4. Urinals.
  5. Lavatories.
  6. Sinks.
  7. Electric Water Cooler.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each of the plumbing fixtures.
  2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flush valves to include in operation and maintenance manuals.

### PART 2 - PRODUCTS

- A. REFER TO PLUMBING FIXTURE SCHEDULE FOR ADDITIONL INFORMATION.

### 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 walls and floors for suitable conditions where plumbing fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Refer to Architectural Drawings for mounting height and exact location of all plumbing fixtures. Handicapped fixtures shall be installed to meet the latest A.D.A. requirements.

### 3.3 QUALITY

- A. Plumbing Contractor shall furnish and install all plumbing fixtures shown on accompanying Drawings. Refer to both Plumbing and Architectural, and provide all fixtures shown on either. Fixtures shall be complete with all necessary brass and accessories required for a complete installation, including traps, escutcheons, angle supplies, basin cocks, etc. All fixtures shall be new and must be delivered to the building properly crated in perfect condition.
- B. All brass must be of the best quality. Lightweight goods will not be accepted.
- C. All brass pipe shall be seamless brass tubing and nipples shall be extra heavy.
- D. All fittings and trim shall be chromium plated heavy brass unless otherwise specified.
- E. "P" traps on lavatories and sinks shall be cast brass with cleanouts.
- F. All exposed piping shall be chromium plated.
- G. Provide cut-off valves at each fixture in both hot and cold water piping.
- H. For the purpose of establishing type and class of fixtures required, the following plate numbers have been taken from the Manufacturer's Catalog as indicated: Other fixture manufacturer's and model numbers, with prior approval, will be acceptable, however fixtures and accessories shall meet standards and features indicated below.
- I. Contractor shall install silicon caulk around the base of a plumbing fixture or around the perimeter of a plumbing fixture where it attaches to a wall. The color of the caulk shall match the color of the plumbing fixture or shall be a color selected by the architect. Verify final color prior to installation. Caulked joint shall be properly smoothed out and shall completely seal the joint between the plumbing fixture and the surface the fixture is attached to. Unacceptable applications shall be completely removed and re-applied in accordance with directions from the architect.
- J. Water-Closet Installation:
  - 1. Install level and plumb according to roughing-in drawings.
  - 2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
  - 3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.
- K. Support Installation:
  - 1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
  - 2. Use carrier supports with waste-fitting assembly and seal.
  - 3. Install floor-mounted, back-outlet water closets attached to building floor substrate, onto waste-fitting seals; and attach to support.
  - 4. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.
- L. Flushometer-Valve Installation:
  - 1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
  - 2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.

3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
4. Install actuators in locations that are easy for people with disabilities to reach.
5. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

M. Install toilet seats on water closets.

N. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

O. Joint Sealing:

1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to water-closet color.
3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

### 3.4 CONNECTIONS

- A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to water closets, allow space for service and maintenance.

### 3.5 ADJUSTING

- A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.
- B. Adjust water pressure at flushometer valves to produce proper flow.

### 3.6 CLEANING AND PROTECTION

- A. Clean plumbing fixtures and fittings with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed plumbing fixtures and fittings.
- C. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 15400



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## Section 15600 – Mechanical General Provisions

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. The General Conditions of the Architectural Specifications, along with the supplementary conditions, special conditions, information to bidders, and any other pertinent information and documents shall apply the same as if repeated herein.



#### 1.02 SCOPE OF WORK

- A. Furnish all labor and material necessary to provide and install the complete mechanical portion of this Contract, including HVAC systems as called for herein and on accompanying drawings. Parts of the mechanical division may be bid separately or in combination, at the Contractor's option; however, it shall be the responsibility of the General Contractor to assure himself that all items covered in the this Division have been included if he chooses to accept separate bids.
- B. This Contractor shall refer to the Architectural and Structural drawings and install equipment, piping, etc. to meet building and space requirements. No equipment shall be bid on or submitted for approval if it will not fit in the space provided.
- C. It is the intention of these Specifications that all mechanical systems shall be furnished complete with all necessary valves, controls, insulation, piping, devices, equipment, etc. necessary to provide a satisfactory installation in working order.
- D. Contractor shall visit the site and acquaint himself thoroughly with all existing facilities and conditions that would affect his portion of the work. Failure to do so shall not relieve the Contractor from the responsibility of installing his work to meet the conditions.
- E. This Contractor shall protect the entire system and all parts thereof from injury throughout the project and up to acceptance of the work. Failure to do so shall be sufficient cause for the Architect to reject any piece of equipment.

#### 1.03 DEMOLITION

- A. The contractor shall visit the site prior to bid to determine the extent of work required to complete the project.
- B. Contractor shall coordinate demolition with owner. The Owner shall have "First Right of Refusal" regarding salvage of all equipment and materials to be removed. Locate equipment as directed by owner. All equipment and materials not salvaged by the owner shall be removed from the site and discarded at the contractor's expense.
- C. Contractor shall coordinate all work with general contractor and phase work as required by project.
- D. All equipment piping, etc. required to be removed to accommodate the modifications shall be removed.

- E. Contractor shall maintain services to existing facilities which shall remain during and after construction is complete.
- F. Contractor shall coordinate any shutdown of services with the owner. It is intended that the building will remain occupied during construction. Contractor shall schedule shut down of services with the owner in order to prevent disruption of building occupancy.
- G. Contractor shall be responsible for draining down of existing systems to complete demolition. All work shall be scheduled with the owner. Contractor shall also be responsible for refilling system and removing all air in order to return the systems to proper operating conditions.
- H. All shut down of services shall be done at night or during a time period approved by the owner. The systems shall be required to be back up and running each morning unless otherwise approved by the owner.

#### 1.04 CUTTING AND PATCHING

- A. Initial cutting and patching shall be the responsibility of the General Contractor, with the Mechanical Contractor being responsible for laying out and marking any and all holes required for the reception of his work. No structural beams or joists shall be cut or thimble without first receiving the approval of the Architect. After initial surfacing has been done, any further cutting, patching and painting shall be done at this Contractor's expense.

#### 1.05 FILL AND CHARGES FOR EQUIPMENT

- A. Fill and charge with materials or chemicals all those devices or equipment as required to comply with the manufacturer's guarantee or as required for proper operation of the equipment.

#### 1.06 MACHINERY GUARDS

- A. This Contractor shall provide v-belt guards for each v-belt drive or other hazardous drive. The guard shall enclose the drive entirely and shall have a hole for taking a tachometer reading.
- B. Provide protective guard for belts, pulleys, gears, couplings, projecting set screws, keys and other rotating parts which are located such that a person might come in close proximity. Construct protective guard around angle iron frame, securely bolted to apparatus; comply with safety requirements. Install guard to completely enclose drives and pulleys and not interfere with lubrication of equipment. Provide 2 inch minimum diameter opening in fan belt guards housing for tachometer.

#### 1.07 EXCAVATION AND BACKFILL

- A. Contractor shall perform all excavating necessary to lay the specified services. Perform excavation of every description and of whatever substance encountered to depths indicated or specified. Pile materials suitable for backfilling a sufficient distance from banks of trenches to prevent slides or cave-ins. Comply with OSHA requirements for excavation, trenching and shoring. Waste excavation materials, rubbish, etc. shall be carted away from the premises, as indicated. Remove water from trenches by pumping or other approved method, discharge at a safe distance from the excavation.

- B. Provide trenches of necessary width for proper laying of pipe and comply with latest publication of OSHA 2226 Excavating and Trenching Operations. Coordinate trench excavation with pipe installation to avoid open trenches for prolonged periods. Accurately grade bottoms of trenches to provide uniform bearing and support for each section of pipe on undisturbed soil or the required thickness of bedding material at every point along its entire length.
- C. Provide minimum 12 inches between outer surfaces and embankment or shoring, which may be used, when excavating for manholes and similar structures. Remove unstable soil that is incapable of supporting the structure in the bottom of the excavation to the depth necessary to obtain design bearing.
- D. Material to be excavated is "unclassified". No adjustment in the contract price will be made on account of the presence or absence of rock, shale, masonry, or other materials.
- E. Protect existing utility lines that are indicated or the locations of which are made known prior to excavating and trenching and that are to be retained. Protect utility lines encountered during excavating and trenching operations, from damage during excavating, trenching and backfilling; if damaged, repair lines as directed by utilities, owner and A/E. Issue notices when utility lines that are to be removed are encountered within the area of operations in ample time for the necessary measures to be taken to prevent interruption of the service.
- F. Provide trenches for utilities of a depth that will provide the following minimum depths of cover from existing grade or from indicated finished grades, or depths of cover in accordance with the manufacturer's recommendations, whichever is lower:
  - 1. 3-Foot Minimum Cover: Chilled Water lines, Heating Hot Water Lines, Condenser Water Lines.
- G. Underground piping shall have a 6" bed of sand below the piping and backfilled with sand to 6" above the top of piping. Select fill may be used above the sand layer.
- H. Backfill trenches after piping, fittings and joints have been tested and approved. Backfill trenches with sand to provide 6 inches of sand below piping and 12 inches of sand cover above piping.
- I. Backfill remainder of trenches with satisfactory material consisting of earth, loam, sandy clay, sand and gravel or soft shale, free from large clods of earth and stones not over 1-1/2 inches in size. Deposit backfill material in 9 inch maximum layers, loose depth as indicated or as specified. Take care not to damage utility lines.
- J. Deposit the remainder of backfill materials in the trench in 1 foot maximum layers and compact by mechanical means. Refer to architectural for minimum density for compaction (Minimum 85 percent of maximum soil density as determined by ASTM D 698). Re-open trenches and excavation pits improperly backfilled or where settlement occurs to the depth required to obtain the specified compaction, the refill and compact with the surface restored to the required grade and compaction.
- K. Backfill utility line trench with backfill material, in 6 inch layers, where trenches cross streets, driveways, building slabs, or other pavement. Moisten each layer and compact to 95 percent of the maximum soil density as determined by ASTM D 698. Accomplish backfilling in such a manner as to permit the rolling and compaction of the filled trench with the adjoining material to provide the required bearing value so that paving of the area can proceed immediately after backfilling is complete.

## 1.08 WELDING

- A. Weld piping and above grade steel tanks in accordance with qualified procedures using performance qualified welders and welding operators. Qualified procedures and welders in accordance with ASME Section IX. Welding procedures qualified by others and welders and welding operators qualified by another employer may be accepted as permitted by ANSI B31.1. Notify the A/E 24 hours in advance of tests, and perform the tests at the work site if practicable. Furnish A/E with a copy of qualified procedures and a list of names and identification symbols of qualified welders and welding operators. Apply welders or welding operators assigned symbols near each weld they make as permanent record.

#### 1.09 NOISE AND VIBRATION

- A. Provide the plumbing system and its associated components, items, piping, and equipment free of objectionable vibration or noise. Statically and dynamically balance rotating equipment and mount or fasten so that no vibration is transmitted to or through the building structure by equipment, piping, ducts or other parts of work, rectify such conditions at no additional compensation.

#### 1.10 PAINTING

- A. All painting shall be by the General Contractor's Painting Sub-Contractor. All pipe, pipe covering, equipment, supports, hangers, etc. exposed in the building or equipment room shall be painted. This Contractor shall prepare the surface of the material to receive the first coat of paint.
- B. All subsequent coatings shall be prepared by the Painting Sub-Contractor. Requirements covering paints, workmanship and preparation of surfaces as stated in the Architectural Specifications shall govern. Colors shall be approved by the Architect. All piping shall be color-coded.
- C. All piping shall be color coded per the following:
  - 1. Ductwork (Exposed in Building) Black

#### 1.09 CLEANING AND ADJUSTING

- A. Upon completion of his work, the Contractor shall clean and adjust all equipment, controls, valves, etc.; clean all piping, ductwork, etc.; and leave the entire installation in good working order.

#### 1.10 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Provide the Owner with three (3) copies of printed instructions indicating various pieces of equipment by name and model number, complete with parts lists, maintenance and repair instructions and test and balance report.
- B. COPIES OF SHOP DRAWINGS WILL NOT BE ACCEPTABLE AS OPERATION AND MAINTENANCE INSTRUCTIONS BUT MUST BE INCLUDED IN SUBMITTAL PACKAGE.
- C. This information shall be bound in plastic hardbound notebooks with the job name permanently embossed on the cover. Rigid board dividers with labeled tabs shall be provided for different pieces of equipment. Submit manuals to the Architect for approval.
- D. In addition to the operation and maintenance brochure, the Contractor shall provide a separate brochure which shall include registered warranty certificates on all equipment, especially any pieces of equipment which carry warranties exceeding one (1) year.
- E. The operation and maintenance brochure shall be furnished with a detailed list of all equipment furnished to the project, including the serial number and all pertinent nameplate data such as voltage, amperage draw, recommended fuse size, rpm, etc. The Contractor shall include this data on each piece of equipment furnished under this contract.

#### 1.11 GUARANTEE

- A. The Contractor shall guarantee all materials, equipment and workmanship for a period of one (1) year from the date of final acceptance of the project. This guarantee shall include furnishing of all labor and material necessary to make any repairs, adjustments or replacement of any equipment, parts, etc. necessary to restore the project to first class condition. This guarantee shall exclude only the changing or cleaning of filters. Warranties exceeding one (1) year are hereinafter specified with individual pieces of equipment.

#### 1.12 LOCAL CONDITIONS

- A. The location and elevation of all utility services is based on available surveys and utility maps and are reasonably accurate; however, these shall serve as a general guide only, and the Contractor shall visit the site and verify the location and elevation of all services to his satisfaction in order to determine the amount of work required for the execution of the Contract.
- B. The Contractor shall contact the various utility companies, determine the extent of their requirements and he shall include in his bid all lawful fees and payments required by these companies for complete connection and services to the building, including meters, connection charges, street patching, extensions from meters to main, etc.
- C. In case major changes are required, this fact, together with the reasons therefor, shall be submitted to the Architect, in writing, not less than seven (7) days before the date of bidding. Failure to comply with this requirement will make the Contractor liable for any changes, additions and expenses necessary for the successful completion of the project.

#### 1.13 PERMITS, INSPECTIONS AND TESTS

- A. All permits, fees, etc. for the installation, inspections, plan review, service connections locations, and/or construction of the work which are required by any authority and/or agencies having jurisdiction, shall be obtained and paid for by the Contractor. This shall be verified during the bidding process.
- B. The Contractor shall make all tests required by the Architect, Engineer or other governing authorities at no additional cost to the Owner.
- C. The Contractor shall notify the Architect and local governing authorities before any tests are made, and the tests are not to be drawn off a line covered or insulated until examined and approved by the authorities. In event defects are found, these shall be corrected and the work shall be retested.
- D. Prior to requesting final inspection by the Architect, the Contractor shall have a complete coordination and adjustment meeting of all of his sub-contractors directly responsible for the operation of any portion of the system. At the time of this meeting, each and every sequence of operation shall be checked to assure proper operation. Notify the Architect in writing ten (10) days prior to this meeting, instructing him of the time, date and whom you are requesting to be present.
- E. This project shall not be accepted until the above provisions are met to the satisfaction of the Architect.

#### 1.14 CODES AND STANDARDS

- A. The entire mechanical work shall comply with the rules and regulations of the City, Parish, County and State in which this project is being constructed, including the State Fire Marshal and the State Board of Health. All modifications required by these authorities shall be made without additional charge to the

Owners. The Mechanical Contractor shall report these changes to the Architect and secure his approval before work is started.

B. In addition to the codes heretofore mentioned, all mechanical work and equipment shall conform to the applicable portions of the following specifications, codes and/or regulations:

1. American Society of Heating, Refrigeration and
2. Air Conditioning Engineers (ASHRAE)
3. National Electrical Code (NEC)
4. National Fire Protection Association (NFPA)
5. American Society of Mechanical Engineers (ASME)
6. American Gas Association (AGA)
7. International Building Code (IBC)
8. International Mechanical Code (IMC)
9. International Plumbing Code (IPC)
10. International Fuel Gas Code (IFGC)
11. Underwriters Laboratories (UL)
12. Life Safety Code (NFPA 101)
13. State Sanitary Code
14. Louisiana State Uniform Construction Code Council (LSUCCC)
15. Facility Guidelines Institute "Guidelines for Design and Construction of Hospitals and Outpatient Facilities" (2014 Edition)

- C. All materials, equipment and accessories installed under this Contract shall conform to all rules, codes, etc. as recommended by National Associations governing the manufacturer, rating and testing of such materials, equipment and accessories. All materials shall be new and of the best quality and first class in every respect. Whenever directed by the Architect, the Contractor shall submit a sample for approval before proceeding.
- D. Where laws or local regulations provide that certain accessories such as gauges, thermometers, relief valves and parts be installed on equipment, it shall be understood that such equipment be furnished complete with the necessary accessories, whether or not called for in these Specifications.
- E. All unfired pressure vessels shall be built in accordance with the A.S.M.E. Code and so stamped. Furnish shop certificates for each vessel.

#### 1.15 REVIEW OF MATERIALS

- A. Whenever manufacturers or trade names are mentioned in these Plans or Specifications, the words "or approved equivalent" shall be assumed to follow whether or not so stated. Manufacturers or trade names are used to establish a standard of quality only, and should not be construed to infer a preference. Equivalent products which meet the Architect's approval will be accepted; however, these products must be submitted to the Architect a minimum of seven (7) days prior to the Bid Date.
- B. Submission shall include the manufacturer's name, model number, rating table and construction features.
- C. Upon receipt and checking of this submittal, the Architect will issue an addendum listing items which are approved as equivalent to those specified. **THE CONTRACTOR SHALL BASE HIS BID SOLELY ON THOSE ITEMS SPECIFIED OR INCLUDED IN THE "PRIOR APPROVAL ADDENDUM", AS NO OTHER ITEM WILL BE ACCEPTABLE.**

- D. Prior approval of a particular piece of equipment does not mean automatic final acceptance and will not relieve the Contractor of the responsibility of assuring himself that this equipment is in complete accord with the Plans and Specifications and that it will fit into the space provided. Shop drawings must be submitted on all items of equipment for approval as hereinafter specified.
- E. Before proceeding with work and/or within thirty (30) days after the award of the General Contract for this work, the Mechanical Contractor shall furnish to the Architect complete shop and working drawings of such apparatus, equipment, controls, insulation, etc. to be provided in this project. These drawings shall give dimensions, weights, mounting data, performance curves and other pertinent information.
- F. The Architect's approval of shop drawings shall not relieve the Contractor from the responsibility of incorrectly figured dimensions or any other errors which may be contained in these drawings. Any omission from the shop drawings or specifications, even though approved by the Architect, shall not relieve the Contractor from furnishing and erecting same.
- G. If contractor submits hard copies, Six (6) sets of shop drawings shall be submitted to the Architect for approval. These submittals shall be supplied as part of this Contractor's contract.
- H. This information shall be bound in plastic hardbound notebooks with the job name on the cover. Rigid board dividers with labeled tabs shall be provided for different pieces of materials and equipment. Submit shop drawings to the Architect for approval. Faxed copies shall not be acceptable. We prefer electronic submissions sent via E-Mail.
- I. Required shop drawing submittals shall include but are not limited to the following:
  - 1. DX Split System Air Conditioning Equipment.
  - 2. Grilles, registers, diffusers and louvers.
  - 3. Ductwork and duct sealer.
  - 4. Duct insulation and accessories.
  - 5. Test and Balancing Agency (including forms).

#### 1.16 COORDINATION DRAWINGS

- A. Submit three (3) black line prints of all mechanical room layouts showing locations of all equipment, piping, etc. to insure all will fit in space provided. Submit drawings at 1/4" scale. Layouts shall include equipment submitted on project to scale on plans.
- B. Submit coordination drawings with the respective equipment shop drawings.

#### 1.17 MINOR DEVIATIONS

- A. Plans and detail sketches are submitted to limit, explain and define conditions, specified requirements, pipe sizes and manner of erecting work. Structural or other conditions may require certain modifications from the manner of installation shown, and such deviations are permissible and shall be made as required. However, specified sizes and requirements necessary for satisfactory operation shall remain unchanged. It may be necessary to shift ducts or pipes, or to change the shape of ducts, and these changes shall be made as required. All such changes shall be referred to the Architect and Engineer for approval before proceeding. Extra charges shall not be allowed for these changes. The contractor shall obtain a full set of plans and specifications for the coordination of his work prior to bidding this project. Items which are unclear to the bidding contractor shall be brought to the Architect



and Engineers attention prior to bidding the project. An interpretation shall be clarified by the Architect and/or the Engineer prior to bidding.

- B. The Contractor shall realize that the drawings could delve into every step, sequence or operation necessary for the completion of the project, without drawing on the Contractor's experience or ingenuity. However, only typical details are shown on the Plans. In cases where the Contractor is not certain about the method of installation of his work, he shall ask for details. Lack of details will not be an excuse for improper installation.
- C. In general, the drawings are diagrammatic and the Contractor shall install his work in a manner so that interferences between the various trades are avoided. In cases where interferences do occur, the Architect is to state which item was first installed.

#### 1.18 AS-BUILT RECORD DRAWINGS

- A. The Contractor shall obtain at his cost, two sets of blackline prints of the original bid documents by the Architect. One set shall be kept on the site with all information as referenced below, and shall update same as the work progresses. The other set will be utilized to record all field changes to a permanent record copy for the Owner.
- B. If the Contractor elects to vary from the Contract Documents and secures prior approval from the Architect for any phase of the work, he shall record in a neat and readable manner, ALL such variances on the blackline print in red. The original blackline prints shall be returned to the Architect for documentation.
- C. All deviations from sizes, locations, and from all other features of the installations shown in the Contract Documents shall be recorded.
- D. In addition, it shall be possible using these drawings to correctly and easily locate, identify and establish sizes of all piping, directions and the like, as well as other features of the work which will be concealed underground and/or in the finished building.
- E. Locations of underground work shall be established by dimensions to columns, lines or walls, locating all turns, etc., and by properly referenced centerline or invert elevations and rates of fall.
- F. For work concealed in the building, sufficient information shall be given so it can be located with reasonable accuracy and ease. In some cases this may be by dimension. In others, it may be sufficient to illustrate the work on the drawings in relation to the spaces in the building near which it was actually installed. The Architect's/Engineer's decision in this matter will be final.
- G. The following requirements apply to all "As-Built" drawings:
  - 1. They shall be maintained at the Contractor's expense.
  - 2. All such drawings shall be done carefully and neatly, and in a form approved by the Architect/Engineer.
  - 3. Additional drawings shall be provided as necessary for clarifications.
  - 4. These drawings shall be kept up-to-date during the entire course of the work and shall be available upon request for examination by the Architect/Engineer; and when necessary, to establish clearances for other parts of the work.
  - 5. "As-built" drawings shall be returned to the Architect upon completion of the work and are subject to approval of the Architect/Engineer.

## PART 2 PRODUCTS

### 2.01 HVAC SYSTEM PRODUCTS

- A. Refer to individual Division 15 sections for mechanical products, controls, fans, pipe, tube and fitting materials and joining methods.

## PART 3 EXECUTION

### 3.01 MANUFACTURER'S DIRECTION

- A. The contractor shall install and operate all equipment and material in accordance with the manufacturer's installation and operating instructions. The manufacturer's instructions of installation and operation shall become part of the Contract Documents and shall supplement the Drawings and Specifications.

### 3.02 EQUIPMENT LABELS

- A. Provide equipment labels for HVAC Equipment. Labels shall have permanent laminated construction secured to equipment.
- B. Provide laminated plate for each V.A.V. box or constant volume box. Attach plate to ceiling grid to indicate location above ceiling. Coordinate color selection with owner.
- C. Provide laminated plate for each VRF unit. For Ducted units above ceiling and refrigerant controllers (BC/BS)- Attach plate to ceiling grid to indicate location above ceiling. Plate shall be white with black letters. For ceiling recessed units – Attached plate within the filter compartment. Tag shall not interfere with the filter installation. Coordinate color selection with owner.

### 3.03 VALVE TAGS

- A. Secure metal tags to all valves. Labeling on all valve tags shall include type of system the valve controls and the area of building, zone, or equipment number affected by valve operation. Tag shall be 2" minimum diameter brass, engraved with code number, service and size. A framed list of the valves, giving manufacturer's name, model number, type and location shall be mounted in the main equipment room.
- B. Provide hinged access doors and frames as follows:
  - 1. Drywall Construction:
    - a. Provide with concealed spring hinges and flush screwdriver operated cam locks in sufficient number of the size of the panel.
    - b. Provide prime paintable surface (not galvanized).
    - c. Product: Milcor "Style M" (Karp DSC-214M).
  - 2. Visible Masonry and Ceramic Tile:
    - a. Milcor "Style M" (Karp DSC-214M).

3. Cement Plaster:
    - a. Milcor "Style K" (KarpDSC-214 PL).
  4. Acoustical Plaster:
    - a. Reinforced panel as required to prevent sagging. Provide continuous steel piano type hinge for the length of the panel, and sufficient number for the size of the panel. Provide factory prime paint surface (not galvanized).
    - b. Product: Milcor "Style AP" (Karp 214 PL).
  5. Acoustical Tile:
    - a. Milcor "Style AT" (Larsen L-CPA).
- C. Provide continuous concealed hinges and cam locks.
- D. Provide UL listed 1-1/2 hour label "B" access doors with automatic self-closing latching mechanism where required.
- E. Provide removable ceiling access tile section immediately adjacent to each mechanical or electrical device located in the ceiling plenum above removable tile ceiling.
- F. Coordinate approval of type, color and location of access doors & frames with Architect.

### 3.04 CLEANING AND SERVICE

- A. Upon Completion of this work, the contractor shall clean and adjust equipment, controls, valves, etc.;
- B. Inspect, clean and service air filters and strainers immediately prior to final acceptance of project.
- C. Provide complete and working charge of proper refrigerant, free of contaminants, into each refrigerant system. After each system has been in operation long enough to ensure completely balanced condition, check the charge and modify it for proper operation as required.
- D. Place mechanical systems in complete working order. Clean equipment and piping materials thoroughly returning to "as new" condition prior to request for substantial completion.
- E. Remove excess materials and debris from mechanical rooms and drain pans. Broom clean areas. Thoroughly clean ductwork inside and outside before air devices (diffusers, grilles, etc.) are installed.

### 3.05 TEMPORARY HEATING AND AIR CONDITIONING DURING CONSTRUCTION PHASE

- A. Permanent building air conditioning equipment or systems are not designed to control building temperature and humidity levels during construction of the building. The building's HVAC system is not designed nor is it well suited for the proper drying of building/construction materials, and should not be used for such purposes.
- B. At all times, during construction phases, provide temporary ventilation both for comfort and protection of workers, for proper drying of wet work, and for proper curing of installed materials. Follow material manufacturer's published instructions with regard to installation of building materials.
- C. Provide temporary heat both for the comfort and protection of workers and as necessary to ensure suitable working conditions for construction operations of construction trades, and also as necessary for storage of products and materials. Refer to material manufacturer's literature for environmental operational temperature and humidity requirements.
- D. Provide temporary heat by use of self-contained, vented portable heating units, employing tanked gas or other approved heat source.
- E. Use only heating apparatus and fuels labeled or listed by a "National Recognized Testing Laboratory" recognized by OSHA. Keep equipment and surroundings in clean, safe conditions.
- F. Use flame resistant tarpaulins other material for temporary enclosures of space.
- G. Provide temporary humidity control by the use of small incremental de-humidifiers, packaged desiccant type de-humidifiers, and/or packaged DX type air conditioners.
- H. Do not permit space temperatures to reach or fall to a level which will cause damage to work. Coordinate the temperature and humidity requirements with the manufacturer of the finishes being provided.
- I. Replace interior or exterior surfaces damaged by the use of temporary heaters with new materials or refinish at no additional expense to the owner.
- J. As soon as practical after permanent heating, ventilation, and air conditioning systems are in place and operable, the contractor at his option, may provide heat from the permanent building heating system, until such time that the building is complete. It is recommended that the building's permanent heating

and air conditioning systems not be utilized to maintain temperature and humidity conditions within the building during the construction phase. Small space heaters and portable de-humidifiers are suggested as sources of temperature and humidity control. It is the intent that the permanent HVAC systems should not be used to condition or control humidity during construction.

- K. The use of permanent HVAC systems will require that the systems be complete and fully controllable by the Building Automation System (BAS) including the ability to remotely alarm proper maintenance personnel in the event of any and all system failure(s) or inability to maintain setpoint temperatures and humidity levels. Should the contractor elect to utilize the building's permanent HVAC system, the contractor shall bring the HVAC systems and ductwork back to an original unused condition or state by thoroughly cleaning and/or repairing both equipment and ductwork including repair and refinishing scrapes, tears, scratches and dents, cleaning ductwork, cleaning AHU coils, etc.
- L. All dust, dirt, fungal growth, and debris in duct work shall be cleaned.
- M. All disposable or wearable parts such as belts, filters, etc., shall be replaced without option or cause.
- N. Contractor's Use of Permanent HVAC Systems:
  - 1. Heating System:
    - a. Should the contractor (at his option and at his own risk), utilize the building's permanent heating systems provided under this contract to provide space heating prior to project completion date subject to the restraints stated herein.
    - b. The fuel for such space heating and for required tests of heating equipment shall be provided by contractor.
    - c. The start up of equipment for use by the contractor shall not commence any warranty period.
    - d. The heating system shall be operated only by qualified personnel, and shall be operated with all auxiliaries, safeties, and in accordance with manufacturer's instructions and good operating practice.
    - e. If at any time the Owner's Representative determines that the equipment is being improperly operated or maintained, contractor will be directed to disconnect its use.
    - f. Heating systems shall be operated and controlled to prevent temperature in any room or space in any building from exceeding 90 deg. F.
    - g. Temperature controls shall be functional to the extent that the operating temperatures of equipment, ductwork piping, etc., shall not either fall or be elevated above or below normal operating limits. The contractor shall demonstrate to the owner or his representative the ability of the system to be controlled, including limit alarms installed and the ability to monitor the systems off-site.
    - h. Systems shall not be operated unattended such as on holidays, weekends, nights, etc, nor shall personnel unfamiliar with the operation of the HVAC Systems be employed to "monitor or attend to" the systems such as security personnel, or janitorial staff. The heating system, when in operation, shall be continuously monitored by the mechanical contractor's approved personnel.

- i. Systems when activated, may be placed into operation without diffusers and registers in place, but filters capable of filtering gypsum dust or other associated construction dust and debris shall be provided both in air handling equipment and at return air grille locations. Filter all return air entering duct work, to prevent return air ductwork from accumulating dust or otherwise becoming dirty.
- j. Prior to final acceptance of the work, the contractor shall place heating systems and related equipment in a condition equal to new in that contractor shall clean all ductwork, coils, equipment, etc.
- k. All disposable or wearable parts such as belts, filters, etc., shall be replaced without option or cause.

2. Preliminary Heating Test, Adjusting and Balancing Report:

- a. Provide a TAB report at the time the heating system(s) start-up which shall indicate the following conditions:
  - 1) Air pressure drop across the unit filters
  - 2) Air pressure drop across the unit's cooling coil(s)
  - 3) Air pressure drop across the unit's heating coil(s)
  - 4) Total static pressure produced by the unit
  - 5) Discharge air static pressure
  - 6) Fan RPM
  - 7) Suction air pressure
  - 8) Provide a unit pressure graph
  - 9) Discharge air temperature (each air moving device)
  - 10) Return air temperature (each air moving device)
  - 11) Entering water temperatures (hot & chilled)
  - 12) Leaving water temperatures (hot & chilled)
  - 13) Water flow quantity (gpm) through the coil(s)(hot & chilled)

3. Air Conditioning System:

- a. Should the contractor (at his option and at his own risk), utilize the building's permanent air conditioning systems provided under this contract to provide space cooling and de-humidification prior to the project completion date. As such, any damages, loss of performance, wear, and other detrimental effects caused by the operational performance characteristics of the A/C system such as condensation, sweating of grilles, registers, diffusers, ducts, equipment, walls, floors, ceilings, and other conditions which may cause damage to building components or which cause mold, mildew, etc., shall be the total responsibility of the contractor.
- b. The fuel, electricity or other energy required for space cooling and for any subsequent operation or testing shall be provided by the Contractor.
- c. The cooling system(s) shall be operated only by fulling qualified personnel and shall be operated with all safety auxiliaries, and in accordance with manufacturer's instructions and good operating practice.
- d. Start-up of equipment for use by the Contractor shall not commence any warranty period.

- e. If at any time the Owner's Representative determines that the equipment is being improperly operated or maintained, the contractor will be directed to discontinue and disconnect its use and the contractor will be required to provide portable units to maintain space temperatures.
  - f. Temporary cooling and/or de-humidification systems shall be operated and controlled to prevent temperature and humidity in any room or space in any portion of the building from falling below 75 deg. F or above 65% relative humidity.
  - g. Temperature controls shall be functional to the extent that the operating temperatures of equipment, ductwork, piping, etc., shall not fall below the normal stated "design" operating limits. The contractor shall demonstrate to the owner or his representative the ability of the system to be controlled, including limit alarms installed and the ability to monitor the systems off-site.
  - h. Insulation systems for all piping, ductwork, etc., shall be completely installed prior to use of the permanent systems.
  - i. Systems shall not be operated unattended such as on holidays, weekends, nights, etc., nor shall personnel unfamiliar with the operation of the HVAC Systems be employed to "monitor or attend to" the systems such as security personnel, or janitorial staff. The air conditioning system when in operation, shall be continuously monitored by the mechanical contractor's approved personnel.
  - j. Systems when activated, may be placed into operation without diffusers and registers in place, but filters capable of filtering gypsum dust or other associated construction dust and debris shall be provided both in air handling equipment and at return air grille locations. Filter all return air entering duct work, to prevent return air duct work from accumulating dust or otherwise becoming dirty.
  - k. Contractor shall, prior to final acceptance of the work, place cooling systems and related equipment in a condition equal to new in that contractor shall clean all ductwork, coils, equipment, etc.
  - l. All disposable or wearable parts such as belts, filters, etc., shall be replaced without option or cause.
4. Preliminary Air Conditioning Test, Adjusting and Balancing Report:
- a. Provide a TAB report at the time the heating system(s) start-up which shall indicate the following conditions:
    - 1) Air pressure drop across the unit filters
    - 2) Air pressure drop across the unit's cooling coil(s)
    - 3) Air pressure drop across the unit's heating coil(s)
    - 4) Total static pressure produced by the unit
    - 5) Discharge air static pressure
    - 6) Fan RPM
    - 7) Suction air pressure
    - 8) Provide a unit pressure graph
    - 9) Discharge air temperature (each air moving device)
    - 10) Return air temperature (each air moving device)
    - 11) Entering water temperatures (hot & chilled)
    - 12) Leaving water temperatures (hot & chilled)

- 13) Water flow quantity (gpm) through the coil(s)(hot & chilled)

END OF SECTION 15600



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# Section 15620 - Hangers and Supports for HVAC Piping and Equipment

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. Section Includes:
  1. Metal pipe hangers and supports.
  2. Trapeze pipe hangers.
  3. Metal framing systems.
  4. Thermal-hanger shield inserts.
  5. Fastener systems.
  6. Pipe stands.
  7. Equipment supports.

### 1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of the Valve and Fittings Industry Inc.

### 1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
  1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
  2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

### 1.5 ACTION SUBMITTALS

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

### 1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

## 1.7 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

## PART 2 - PRODUCTS

### 2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
  - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
  - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
  - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
  - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
  - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

### 2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

### 2.3 METAL FRAMING SYSTEMS

- A. MFMA Manufacturer Metal Framing Systems:
  - 1.
  - 2. Manufacturers:
    - a. Cooper B-Line, Inc.; a division of Cooper Industries.
    - b. Flex-Strut Inc.
    - c. Thomas & Betts Corporation, A Member of the ABB Group.
    - d. Unistrut; an Atkore International company.
    - e. Wesanco, Inc.
  - 3. Standard: MFMA-4.
  - 4. Channels: Continuous slotted steel channel with inturred lips.
  - 5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
  - 6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
  - 7. Metallic Coating: Electroplated zinc.

### 2.4 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened Portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

## 2.5 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.
- B. Roof Sleepers for VRF outdoor condensing units: Pate Model ES-2 or equal, equipment rail supports, 18 ga. Galvanized steel, unitized construction with integral base plate, continuous welded corner seams, pressure treated wood nailer, counterflashing with screws. Height of support shall be a minimum of 16 inches. Coordinate layout of supports with the equipment manufacturer's representative and equipment point loading requirements. Coordinate flashing and exterior insulation with the roofing installer and Architect.

## 2.6 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
  - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
  - 2. Design Mix: 5000-psi, 28-day compressive strength.

## PART 3 - EXECUTION

### 3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
  - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
  - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Fastener System Installation:
  - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
  - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- M. Insulated Piping:
  - 1. Attach clamps and spacers to piping.
    - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
  - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
    - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
  - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
    - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
  - 4. Shield Dimensions for Pipe: Not less than the following:
    - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    - b. NPS 4: 12 inches long and 0.06 inch thick.
    - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
  - 5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
  - 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

### 3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

### 3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

### 3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

### 3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

### 3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use carbon-steel pipe hangers and supports metal trapeze pipe hangers and metal framing systems and attachments for general service applications.
- E. Use thermal-hanger shield inserts for insulated piping and tubing.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.

2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.

4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
  5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
  2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
  3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
  4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
  5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
  6. C-Clamps (MSS Type 23): For structural shapes.
  7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
  8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
  9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
  10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
  11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
  12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    - a. Light (MSS Type 31): 750 lb.
    - b. Medium (MSS Type 32): 1500 lb.
    - c. Heavy (MSS Type 33): 3000 lb.
  13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
  14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
  15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
  2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
  3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
  2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
  3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
  4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
  5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
  6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.



7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
  8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
    - a. Horizontal (MSS Type 54): Mounted horizontally.
    - b. Vertical (MSS Type 55): Mounted vertically.
    - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- L. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- M. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

END OF SECTION 15620

## Section 15640 – Duct Insulation

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes insulating the following duct services:
  - 1. Indoor, concealed supply, return, exhaust and outdoor air.
  - 2. Indoor, exposed supply, return, exhaust and outdoor air.
  - 3. Tops of supply air diffusers, grilles and plenum boxes.
  - 4. Indoor, kitchen hood and kitchen hood exhaust air.
  - 5. Indoor, kitchen hood make-up supply air.
  - 6. Outdoor, supply and return air.
  - 7. Mechanical Room Walls

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance, thickness, and jackets (both factory- and field-applied if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
  - 2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
  - 3. Detail application of field-applied jackets.
  - 4. Detail application at linkages of control devices.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers,

attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

- C. Field quality-control reports.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
  - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
  - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

## 1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields as specified.
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

## 1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## PART 2 - PRODUCTS

### 2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," articles for where insulating materials shall be applied.

- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Fire Rated Insulation:
  - 1. Manufacturer shall be one of the following:
    - a. 3M FireMaster Fast Wrap 615+.
    - b. Thermal Ceramics FireMaster.
- G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type II for sheet materials.
  - 1. Manufacturer shall be one of the following:
    - a. Aeroflex, USA, Inc.
    - b. Armacell LLC.
- H. Fiber-Glass Blanket Insulation: Fiber-Glass bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
  - 1. Manufacturer shall be one of the following:
    - a. Certainteed Corporation.
    - b. Johns Manville; a Berkshire Hathaway company.
    - c. Knauf Insulation.
    - d. Manson Insulation Inc.
    - e. Owens Corning.

## 2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.
  - 1. Manufacture shall be one of the following:
    - a. Aeroflex USA, Inc.
    - b. Armacell LLC.
    - c. Foster Brand.
- C. Fiber-Glass Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
  - 1. Manufacturer shall be one of the following:
    - a. Childers Brand.
    - b. Eagle Bridges – Marathon Industries.
    - c. Foster Brand.
    - d. Mon-Eco Industries, Inc.

## 2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
  - 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
  - 1. Manufacturer:
    - a. Foster Brand.
    - b. Knauf Insulation.
    - c. Vimasco Corporation.
    - d. Childers.
  - 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
  - 3. Service Temperature Range: Minus 20 to plus 180 deg F.
  - 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
  - 5. Color: White.

## 2.4 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:
  - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
  - 2. Fire- and water-resistant, flexible, elastomeric sealant.
  - 3. Service Temperature Range: Minus 40 to plus 250 deg F.
  - 4. Color: Aluminum.
  - 5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 6. Sealants 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."

## 2.5 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
  - 1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

## 2.6 TAPES

- A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
  - 1. Width: 3 inches.
  - 2. Thickness: 6.5 mils.
  - 3. Adhesion: 90 ounces force/inch in width.
  - 4. Elongation: 2 percent.
  - 5. Tensile Strength: 40 lbf/inch in width.
  - 6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

## 2.7 SECUREMENTS

### A. Bands:

1. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.

### B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch- diameter shank, length to suit depth of insulation indicated.
2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
  - a. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
  - b. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
  - c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
  - d. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
  - e. Spindle: Nylon, 0.106-inch- diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
  - f. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

## 2.8 WALL LINER

### A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers shall be as follows:
  - a. Certainteed
  - b. Owens Corning
  - c. Johns Manville
  - d. Knauf
2. Maximum Thermal Conductivity:
  - a. Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
3. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
4. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

- a. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
  1. Verify that systems to be insulated have been tested and are free of defects.
  2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

### 3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.

- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth.
  - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
  - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
    - a. For below ambient services, apply vapor-barrier mastic over staples.
  - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
  - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

### 3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
  - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
  - 1. Seal penetrations with flashing sealant.



2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
  4. Seal jacket to wall flashing with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
- E. Insulation Installation at Floor Penetrations:
1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
  2. Seal penetrations through fire-rated assemblies.

### 3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

### 3.6 INSTALLATION OF FIBER-GLASS INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
  2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
  3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
    - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    - d. Do not overcompress insulation during installation.
    - e. Impale insulation over pins and attach speed washers.
    - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
  4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

- a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
  - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
- 5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
  - 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
  - 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

### 3.7 WALL LINER

- A. Apply on all mechanical room walls from floor to ceiling / deck.
  - 1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
  - 2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
  - 3. Butt transverse joints without gaps, and coat joint with adhesive.
  - 4. Fold and compress liner in corners or cut and fit to ensure butted-edge overlapping.
  - 5. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

### 3.8 FIELD-APPLIED JACKET INSTALLATION

- A. Where FSK jackets are indicated, install as follows:
  - 1. Draw jacket material smooth and tight.
  - 2. Install lap or joint strips with same material as jacket.
  - 3. Secure jacket to insulation with manufacturer's recommended adhesive.
  - 4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
  - 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

### 3.9 FIRE-RATED INSULATION SYSTEM INSTALLATION

- A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.
- C. Install firestopping at penetrations through fire-rated assemblies.

### 3.10 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified.
  - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
    - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

### 3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
  - 1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

### 3.12 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
  - 1. Indoor, concealed supply air.
  - 2. Indoor, concealed return air.
  - 3. Indoor, concealed exhaust air.
  - 4. Indoor, concealed outdoor air.
  - 5. Indoor, return air plenum boxes.
  - 6. Indoor, tops of ceiling diffusers and grilles.
  - 7. Indoor, exposed supply air.
  - 8. Indoor, exposed return air.

9. Indoor, exposed exhaust air.
10. Indoor, exposed outdoor air.
11. Indoor, kitchen hood and kitchen hood exhaust air.
12. Indoor, kitchen hood make-Up supply air.
13. Outdoor, supply air.
14. Outdoor, return air.
15. Mechanical Room Walls

B. Items Not Insulated:

1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
2. Factory-insulated flexible ducts.
3. Factory-insulated plenums and casings.
4. Flexible connectors.
5. Vibration-control devices.
6. Factory-insulated access panels and doors.

### 3.13 DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, round and flat-oval, supply-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
2. Minimum installed R-value shall be R-6.0.

B. Concealed, round and flat-oval, return-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
2. Minimum installed R-value shall be R-6.0.

C. Concealed, round and flat-oval, outdoor-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
2. Minimum installed R-value shall be R-6.0.

D. Concealed, round and flat-oval, exhaust-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
2. Minimum installed R-value shall be R-6.0.

E. Concealed, rectangular, supply-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
2. Minimum installed R-value shall be R-6.0.

F. Concealed, rectangular, return-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
2. Minimum installed R-value shall be R-6.0.

G. Concealed, rectangular, outdoor-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
2. Minimum installed R-value shall be R-6.0.

- H. Concealed, rectangular, exhaust-air duct insulation between isolation damper and penetration of building exterior shall be the following:
  - 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
  - 2. Minimum installed R-value shall be R-6.0.
  
- I. Concealed, supply-air plenum insulation shall be the following:
  - 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
  - 2. Minimum installed R-value shall be R-6.0.
  
- J. Return air plenum boxes installation shall be the following:
  - 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
  - 2. Minimum installed R-value shall be R-6.0.
  
- K. Tops of supply air diffusers and grilles insulation shall be the following:
  - 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
  - 2. Minimum installed R-value shall be R-6.0.
  
- L. Exposed, rectangular, supply-air duct insulation shall be the following:
  - 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
  - 2. Minimum installed R-value shall be R-6.0.
  
- M. Exposed, rectangular, return-air duct insulation shall be the following:
  - 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
  - 2. Minimum installed R-value shall be R-6.0.
  
- N. Exposed, supply-air plenum insulation shall be the following:
  - 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
  - 2. Minimum installed R-value shall be R-6.0.
  
- O. Exposed, return-air plenum insulation shall be the following:
  - 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
  - 2. Minimum installed R-value shall be R-6.0.
  
- P. Indoor, kitchen hood and kitchen hood exhaust air shall be the following:
  - 1. Fire rated blanket: (Minimum) Two layers of 1-1/2" thick fire wrap insulation.
  - 2. Insulate the grease duct with a high temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2 hour fire rating. Thickness of insulation and the quantity of layers shall be as required to achieve 2-hour fire rating. The fire rated blanket system shall be installed in accordance with the manufacturer's recommendations to meet the latest NFPA requirements for 0 inch clearance to combustibles.
  
- Q. Indoor, kitchen hood make-Up supply air shall be the following:
  - 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
  - 2. Minimum installed R-value shall be R-6.0.
  
- R. Outdoor (exposed to weather), supply air shall be the following:
  - 1. Elastomeric Insulation: 2 inch thick flexible blanket.
  - 2. Install jacket over insulation material with Stainless Steel, Type 304 or Type 316, sheet metal with 0.024 inch thickness.
  - 3. In lieu of the stainless steel jacket, at contractor's option, the contractor may provide a paint grip sheet metal rain cap to cover the duct insulation. Paint the rain cap. Coordinate the final finish color of the sheet metal rain cap with the Architect. Provide three coats of paint.
  
- S. Outdoor (exposed to weather), return air shall be the following:

1. Elastomeric Insulation: 2 inch thick flexible blanket.
2. Install jacket over insulation material with Stainless Steel, Type 304 or Type 316, sheet metal with 0.024 inch thickness.
3. In lieu of the stainless steel jacket, at contractor's option, the contractor may provide a paint grip sheet metal rain cap to cover the duct insulation. Paint the rain cap. Coordinate the final finish color of the sheet metal rain cap with the Architect. Provide three coats of paint.

T. Mechanical Room Wall Liner

1. Wall Liner: Fibrous glass, Type I, **[1 inch]** **[1-1/2 inches]** **[2 inches]** thick.

END OF SECTION 15640

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## Section 15650 - HVAC Piping Insulation

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes insulating the following HVAC piping systems:
  - 1. Condensate drain piping, indoors and outdoors.
  - 2. Refrigerant suction and hot-gas piping, indoors and outdoors.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
  - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
  - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.



## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

## 1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified.
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

## 1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## PART 2 - PRODUCTS

### 2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," and "Outdoor, Aboveground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
  - 1. Manufacturer shall be one of the following:
    - a. Armacell AP.
    - b. Aeroflex USA.
    - c. K-Flex USA.

### 2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

- B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
  - 1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## 2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
  - 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.
  - 1. Manufacturers shall be one of the following:
    - a. Childers Brand.
    - b. Eagle Bridges – Marathon Industries.
    - c. Foster Brand.
  - 2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
  - 3. Service Temperature Range: Minus 50 to plus 220 deg F.
  - 4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
  - 5. Color: White.

## 2.4 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. Metal Jacket:
  - 1. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
    - a. Finish and thickness are indicated in field-applied jacket schedules.
    - b. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
    - c. Factory-Fabricated Fitting Covers:
      - 1) Same material, finish, and thickness as jacket.
      - 2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
      - 3) Tee covers.
      - 4) Flange and union covers.
      - 5) End caps.
      - 6) Beveled collars.
      - 7) Valve covers.
      - 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
  - 2. At contractor's option, in lieu of 0.016 aluminum jacket, the contractor may use Venture Clad 1577CW multi-layered laminate coated, acrylic pressure sensitive adhesive jacket system.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
  - 1. Verify that systems to be insulated have been tested and are free of defects.
  - 2. Verify that surfaces to be insulated are clean and dry.

3. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

### 3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- L. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- M. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

### 3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
  1. Seal penetrations with flashing sealant.
  2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
  4. Seal jacket to roof flashing with flashing sealant.

- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
  - 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
  - 1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistant joint sealers.
- F. Insulation Installation at Floor Penetrations:
  - 1. Pipe: Install insulation continuously through floor penetrations.
  - 2. Seal penetrations through fire-rated assemblies.

### 3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
  - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
  - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
  - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
  - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
  - 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

### 3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
  1. Install pipe insulation to outer diameter of pipe flange.
  2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
  3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
  4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
  1. Install mitered sections of pipe insulation.
  2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
  1. Install preformed valve covers manufactured of same material as pipe insulation when available.
  2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
  3. Install insulation to flanges as specified for flange insulation application.
  4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

### 3.7 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 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.

### 3.9 INDOOR PIPING INSULATION SCHEDULE

- A. Condensate and Equipment Drain Water below 60 Deg F:
  1. All Pipe Sizes: Insulation shall be the following:
    - a. Flexible Elastomeric: 3/4 inch thick.
- B. Refrigerant Suction and Hot-Gas Piping:
  1. All Pipe Sizes: Insulation shall be the following:
    - a. Flexible Elastomeric: 3/4 inch thick.

### 3.10 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

- A. Refrigerant Suction and Hot-Gas Piping:
  1. All Pipe Sizes: Insulation shall be the following:
    - a. Flexible Elastomeric: 1 inches thick.

### 3.11 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Refrigerant Piping, Concealed:
  1. None.
- D. Refrigerant Piping, Exposed:
  1. Aluminum, Smooth: 0.016 inch thick.

### 3.12 OUTDOOR, FIELD-APPLIED MASTIC SCHEDULE

- A. Install two layers of mastic over insulation material.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Condensate Piping, Concealed:
  1. None.
- D. Condensate Piping, Exposed:
  1. Vapor-Barrier Mastic: Solvent based.

END OF SECTION 15650

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## Section 15670 – HVAC Condensate Piping

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes pipe and fitting materials and joining methods for the following:
  - 1. Condensate-drain piping.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
  - 1. Copper Tube.
  - 2. Plastic pipe and fittings with solvent cement.
- B. Delegated-Design Submittal:
  - 1. Design calculations and detailed fabrication and assembly of pipe anchors and alignment guides, hangers and supports for multiple pipes, expansion joints and loops, and attachments of the same to the building structure.
  - 2. Locations of pipe anchors and alignment guides and expansion joints and loops.
  - 3. Locations of and details for penetrations, including sleeves and sleeve seals for exterior walls, floors, basement, and foundation walls.
  - 4. Locations of and details for penetration and firestopping for fire- and smoke-rated wall and floor and ceiling assemblies.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

#### 1.4 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
  - 1. Condensate-Drain Piping: 140 deg F.



## 2.2 COPPER TUBE AND FITTINGS

- A. DWV Copper Tubing: ASTM B 306, Type DWV.

## 2.3 PLASTIC PIPE AND FITTINGS

- A. PVC Plastic Pipe: ASTM D 1785, with wall thickness as indicated in "Piping Applications" Article.
  - 1. PVC Plastic Pipe Fittings: Socket-type pipe fittings, ASTM D 2466 for Schedule 40 pipe; ASTM D 2467 for Schedule 80 pipe.

## 2.4 JOINING MATERIALS

- A. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.
- B. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.
- D. Solvent Cements for Joining Plastic Piping:
  - 1. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
    - a. PVC solvent cement shall have a VOC content of 510 g/L or less.
    - b. Adhesive primer shall have a VOC content of 550 g/L or less.
    - c. Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Health Services) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

## 2.5 TRANSITION FITTINGS

- A. Plastic-to-Metal Transition Fittings:
  - 1. One-piece fitting with one threaded brass or copper insert and one solvent-cement-joint end of material and wall thickness to match plastic pipe material.
- B. Plastic-to-Metal Transition Unions:
  - 1. Brass or copper end, solvent-cement-joint end of material and wall thickness to match plastic pipe material, rubber gasket, and threaded union.

## 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.

## PART 3 - EXECUTION

### 3.1 PIPING APPLICATIONS

- A. Condensate-Drain Piping: Type DWV, drawn-temper copper tubing, wrought-copper fittings, and soldered joints or Schedule 40 PVC plastic pipe and fittings and solvent-welded joints.
- B. Condensate-Drain Piping: Schedule 40 PVC plastic pipe and fittings and solvent-welded joints.

### 3.2 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- L. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- M. Install shutoff valve immediately upstream of each dielectric fitting.
- N. Comply with requirements specified for identifying piping.

### 3.3 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 nipples.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric nipples.

### 3.4 HANGERS AND SUPPORTS

- A. Comply with requirements specified for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.
- B. Install the following pipe attachments:
  - 1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
  - 2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
  - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
  - 4. Spring hangers to support vertical runs.
  - 5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
  - 6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.
- C. Install hangers for copper piping with the following maximum spacing and minimum rod sizes:
  - 1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
  - 2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
  - 3. NPS 1-1/4: Maximum span, 7 feet; minimum rod size, 3/8 inch.
  - 4. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
  - 5. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
  - 6. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
  - 7. NPS 3 and Larger: Maximum span, 10 feet; minimum rod size, 3/8 inch.
- D. Plastic Piping Hanger Spacing: Space hangers shall be according to pipe manufacturer's written instructions for service conditions. Avoid point loading. Space and install hangers with the fewest practical rigid anchor points.
- E. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

### 3.5 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.
- E. Plastic Piping Solvent-Cemented 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 Pressure Piping: Join ASTM D 1785 schedule number, 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.
  - 3. PVC Nonpressure Piping: Join according to ASTM D 2855.

- F. Mechanically Formed, Copper-Tube-Outlet Joints: Use manufacturer-recommended tool and procedure, and brazed joints.

END OF SECTION 15670

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# Section 15680 - Refrigerant Piping

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. Section Includes:
  1. Refrigerant pipes and fittings.
  2. Refrigerant piping valves and specialties.
  3. Refrigerants.

### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of valve, refrigerant pipe and refrigerant piping specialty.
- B. Shop Drawings:
  1. Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes; flow capacities; pipe lengths, branch controller locations, valve arrangements and locations; slopes of horizontal runs; oil traps; double risers; wall and floor penetrations; and equipment connection details.
  2. Show piping size and piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
  3. Show interface and spatial relationships between piping and equipment.
  4. Calculate refrigerant volume based on actual pipe layout for each VRF system.
  5. Shop Drawing Scale: 1/8 inch equals 1 foot.

### 1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Field quality-control reports.

### 1.5 QUALITY ASSURANCE

- A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

## 1.6 PRODUCT STORAGE AND HANDLING

- A. Store piping with end caps in place to ensure that piping interior and exterior are clean when installed.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for Refrigerant R-410A:
  - 1. Suction Lines for Air-Conditioning Applications: 300 psig.
  - 2. Suction Lines for Heat-Pump Applications: 535 psig.
  - 3. Hot-Gas and Liquid Lines: 535 psig.

### 2.2 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 88, Type K or ASTM B 280, Type ACR.
- B. Contractor may use pre-insulated refrigerant line sets provided and/or approved by the VRF equipment manufacturer.

### 2.3 REFRIGERANTS

- A. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

## PART 3 - EXECUTION

### 3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

- A. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR Type L, annealed- or drawn-temper tubing and copper fittings with brazed joints.
- B. Safety-Relief-Valve Discharge Piping: Copper, Type L, annealed- or drawn-temper tubing and wrought-copper fittings with soldered joints.

### 3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified if valves or equipment requiring maintenance is concealed behind finished surfaces.
- L. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- M. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

### 3.3 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.
- D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
  1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
  2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

### 3.4 HANGERS AND SUPPORTS

- A. Comply with requirements for pipe hangers and supports specified.
- B. Install the following pipe attachments:
  1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
  2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
  3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
  4. Spring hangers to support vertical runs.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod diameters:
  1. NPS 1/2: Maximum span, 60 inches; minimum rod, 1/4 inch.



2. NPS 5/8: Maximum span, 60 inches; minimum rod, 1/4 inch.
3. NPS 1: Maximum span, 72 inches; minimum rod, 1/4 inch.
4. NPS 1-1/4: Maximum span, 96 inches; minimum rod, 3/8 inch.
5. NPS 1-1/2: Maximum span, 96 inches; minimum rod, 3/8 inch.
6. NPS 2: Maximum span, 96 inches; minimum rod, 3/8 inch.
7. NPS 2-1/2: Maximum span, 108 inches; minimum rod, 3/8 inch.
8. NPS 3: Maximum span, 10 feet; minimum rod, 3/8 inch.
9. NPS 4: Maximum span, 12 feet; minimum rod, 1/2 inch.

### 3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  1. Comply with ASME B31.5, Chapter VI.
  2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
  3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.
    - a. Fill system with nitrogen to the required test pressure.
    - b. System shall maintain test pressure at the manifold gage throughout duration of test.
    - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.
  4. For VRF Systems: Test all refrigerant systems with pressure and vacuum per manufacturers recommendations. Refrigerant lines shall be tested under 600 (Minimum) psi Nitrogen pressure (or as recommended by manufacture for refrigerant type being used in each system) for 24 hours using soap suds at joints to test for leaks. Contractor shall perform a vacuum test (triple pull down test) at 1500 Microns with nitrogen break, then 1000 microns with nitrogen break, then 500 microns – disconnect vacuum pump and hold vacuum for one (1) hour (Maximum of 100-point rise within the one-hour time period). If any test fails, the contractor shall repair leak(s) and completely retest the piping systems(s) (Pressure and vacuum tests). Once all tests are passed, evacuate the system, and properly charge with Refrigerant.
- B. Prepare test and inspection reports.

### 3.6 SYSTEM CHARGING

- A. Charge system using the following procedures:
  1. Install core in filter dryers after leak test but before evacuation.
  2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
  3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
  4. Charge system with a new filter-dryer core in charging line.

END OF SECTION 15680

## Section 15690 - Metal Ducts

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  1. Single-wall rectangular ducts and fittings.
  2. Single-wall round ducts and fittings.
  3. Sheet metal materials.
  4. Sealants and gaskets.
  5. Hangers and supports.

#### 1.3 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"
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of the following products:
  1. Adhesives.
  2. Sealants and gaskets.

### PART 2 - PRODUCTS

#### 2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

## 2.2 SINGLE-WALL 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.
- 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."
  - 1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
  - 2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.
- 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. Duct Galvanized Coating Designation: G90.
  - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.

- C. Galvanized sheet metal for rectangular and round ductwork shall have a minimum gauge of 26.

## 2.4 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

- 1. Manufacturers shall be as follows:
  - a. Certaineed
  - b. Owens Corning
  - c. Johns Manville
  - d. Knauf
- 2. Maximum Thermal Conductivity:
  - a. Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
- 3. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
- 4. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
  - a. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

- B. Insulation Pins and Washers:

- 1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
- 2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

- C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."

- 1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
- 2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
- 3. Butt transverse joints without gaps, and coat joint with adhesive.
- 4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
- 5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
- 6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.

7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
  - a. Fan discharges.
  - b. Intervals of lined duct preceding unlined duct.
  - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
  - a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.
10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

## 2.5 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: 4 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, sealant shall have 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. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum 60 percent.
5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

E. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

G. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum 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.

## 2.6 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.

## 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. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements as specified for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

### 3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

### 3.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article."
- B. If ducts are not listed in the "Duct Schedule" Article then seal unlisted ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
  - 1. Ducts:
    - a. Pressure Class: Positive 2-inch wg.
    - b. Minimum SMACNA Seal Class: A.
    - c. SMACNA Leakage Class for Rectangular: 6.
    - d. SMACNA Leakage Class for Round and Flat Oval: 3.

### 3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: 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.
  - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less 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 intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

### 3.5 CONNECTIONS

- A. Make connections to equipment with flexible connectors.



- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

### 3.6 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer.

### 3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.

- B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:
  - a. Ducts with a Pressure Class Higher Than **3-Inch wg**:
    - 1) Test representative duct sections totaling no less than **25 percent** of total installed duct area for each designated pressure class.
  - b. Exhaust Ducts with a Pressure Class of **2-Inch wg or Higher**:
    - 1) Test representative duct sections totaling no less than **50 percent** of total installed duct area for each designated pressure class.
  - c. Outdoor Air Ducts with a Pressure Class of **2-Inch wg or Higher**:
    - 1) Test representative duct sections totaling no less than **50 percent** of total installed duct area for each designated pressure class.
3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
6. Give seven days' advance notice for testing.

- C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
  - a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

- D. Duct system will be considered defective if it does not pass tests and inspections.

- E. Prepare test and inspection reports.

### 3.8 DUCT CLEANING

- A. Clean [**new**] [**and**] [**existing**] duct system(s) before testing, adjusting, and balancing.

- B. Use service openings for entry and inspection.
1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer.
  2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
  3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Particulate Collection and Odor Control:
1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
  2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- D. Clean the following components by removing surface contaminants and deposits:
1. Air outlets and inlets (registers, grilles, and diffusers).
  2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
  3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
  4. Coils and related components.
  5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
  6. Supply-air ducts, dampers, actuators, and turning vanes.
  7. Dedicated exhaust and ventilation components and makeup air systems.
- E. Mechanical Cleaning Methodology:
1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
  2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
  3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
  4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
  5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
  6. Provide drainage and cleanup for wash-down procedures.
  7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

### 3.9 START UP

- A. Air Balance: Comply with requirements as specified.

### 3.10 DUCT SCHEDULE

- A. Supply Ducts:
  - 1. Ducts Connected to Upstream of VAV boxes:
    - a. Pressure Class: Positive 6-inch wg.
    - b. Minimum SMACNA Seal Class: A.
    - c. SMACNA Leakage Class for Rectangular: 6.
    - d. SMACNA Leakage Class for Round and Flat Oval: 3.
- B. Supply Ducts:
  - 1. Ducts Connected to Downstream of VAV boxes:
    - a. Pressure Class: Positive 4-inch wg.
    - b. Minimum SMACNA Seal Class: A.
    - c. SMACNA Leakage Class for Rectangular: 6.
    - d. SMACNA Leakage Class for Round and Flat Oval: 3.
- C. Supply Ducts:
  - 1. Ducts Connected to Constant-Volume Units, VRF Outside Air Units and RTUs:
    - a. Pressure Class: Positive 2-inch wg.
    - b. Minimum SMACNA Seal Class: A.
    - c. SMACNA Leakage Class for Rectangular: 6.
    - d. SMACNA Leakage Class for Round and Flat Oval: 3.
- D. Return Ducts:
  - 1. Ducts Connected to Variable-Volume Units:
    - a. Pressure Class: Positive 2-inch wg.
    - b. Minimum SMACNA Seal Class: A.
    - c. SMACNA Leakage Class for Rectangular: 6.
    - d. SMACNA Leakage Class for Round and Flat Oval: 3.
- E. Return Ducts:
  - 1. Ducts Connected to Constant-Volume Units, VRF Outside Air Units and RTUs:
    - a. Pressure Class: Positive or negative 2-inch wg.
    - b. Minimum SMACNA Seal Class: A.
    - c. SMACNA Leakage Class for Rectangular: 6.
    - d. SMACNA Leakage Class for Round and Flat Oval: 3.
- F. 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: 6.
- G. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:
  - 1. Ducts Connected to Constant-Volume Units, VRF Outside Air Units:
    - a. Pressure Class: Positive or negative 2-inch wg.
    - b. Minimum SMACNA Seal Class: A.
    - c. SMACNA Leakage Class for Rectangular: 6.
    - d. SMACNA Leakage Class for Round and Flat Oval: 3.
- H. Duct Liner:
  - 1. Supply Air Ducts: Fibrous glass, Type I, **[1 inch] [1-1/2 inches] [2 inches]** thick.
  - 2. Return Air Ducts: Fibrous glass, Type I, **[1 inch] [1-1/2 inches] [2 inches]** thick.

3. Supply Diffuser Plenums: Fibrous glass, Type I, [1 inch] [1-1/2 inches] [2 inches] thick.
4. Return- Plenums: Fibrous glass, Type I, [1 inch] [1-1/2 inches] [2 inches] thick.
5. Transfer Ducts: Fibrous glass, Type I, [1 inch] [1-1/2 inches] [2 inches] thick.

END OF SECTION 15690

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# Section 15720 - Diffusers, Registers, Grilles, and Louvers

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. Section Includes:
  - 1. Fixed face registers and grilles.
- B. Related Sections:
  - 1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, include the following:
  - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
  - 2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

## PART 2 - PRODUCTS

### 2.1 REGISTERS AND GRILLES

- A. Fixed Face Register:
  - 1. Manufacturers:
    - a. Titus.
    - b. Price Industries.
    - c. Nailor Industries.
    - d. Metalaire, Inc.
  - 2. Material: Aluminum.
  - 3. Finish: Baked enamel, white.
  - 4. Core Construction: Integral.
  - 5. Frame: 1 inch wide.
  - 6. Mounting: Lay in.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 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.

### 3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 15720

## Section 15790 - Testing, Adjusting, and Balancing for HVAC

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SCOPE OF WORK

- A. The Contractor shall obtain the services of an independent Test and Balance (TAB) Company which specializes in the testing and balancing of heating, ventilating and air conditioning (HVAC) systems to test, adjust and balance all HVAC systems in the building(s).
- B. The work included in this section consists of furnishing labor, instruments, and tools required in testing, adjusting and balancing the HVAC systems as described in these specifications or shown on accompanying drawings. Services shall include checking equipment performance, taking the specified measurements, and recording and reporting the results. The testing, adjusting and balancing agency shall act as a reporting agency; that is, list and report each piece of equipment as to identification number, manufacturer, model number, serial number, proper location, specified performance, and report actual performance of all equipment as found during testing. The report is intended to be used during the life of the building as a ready reference indicating original conditions, equipment components, etc.
- C. Representatives of the Test and Balance Company shall visit the job site during installation of the HVAC equipment, piping and ductwork as required.
- D. Upon completion of the HVAC system installation, the Test and Balance Company shall perform all required testing and balancing with the full cooperation of the Contractor and his Sub-contractors. The Contractor shall make changes and/or adjustments to the HVAC system components that are required by the Test and Balance Company to accomplish proper balancing. The TAB agency shall not supply or install any materials or balancing devices such as pulleys, drives, belts, etc. All of this work is by the Contractor and shall be performed at no additional cost to the Owner.
- E. The test and balance report complete with a summary page listing all deficiencies shall be submitted to the Architect for review. If the Architect agrees with the report, he shall sign it and return it to the Contractor. The test and balance report must be complete and must be accepted by the Architect prior to acceptance of the project. Any outstanding test and balance items shall be placed on the punch list and a monetary value shall be assigned to them.
- F. After all deficiencies have been corrected the Architect shall sign the testing and balancing report, and the Test and Balance Company shall supply four (4) copies of the final and complete report to the Contractor for inclusion in the Operation and Maintenance Manuals.
- G. The Test and Balance Company shall obtain a copy of all HVAC related shop drawings from the contractor. The contractor shall provide a set of approved shop drawings to the TAB contractor within 30 days from receiving approved shop drawings.



H. The items requiring testing, adjusting, and balancing include (but are not restricted to) the following:

1. Air Systems:
  - a. Supply Fan AHU
  - b. Zone Branch and main ducts
  - c. Diffusers, Registers, Grilles and Dampers
  - d. Coils (Air Temperatures)
2. Duct leakage tests.

### 1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. BAS: Building automation systems.
- C. NEBB: National Environmental Balancing Bureau.
- D. TAB: Testing, adjusting, and balancing.
- E. TABB: Testing, Adjusting, and Balancing Bureau.
- F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- G. TDH: Total dynamic head.

### 1.4 INFORMATIONAL SUBMITTALS

- A. Certified TAB reports.
- B. Sample report forms.

### 1.5 QUALITY ASSURANCE

- A. TAB Specialists Qualifications: Certified by AABC NEBB or TABB.
- B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- D. 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 installed systems for 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 applicable for intended purpose and are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they 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 and pump curves.
  - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
  - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- J. Examine operating safety interlocks and controls on HVAC equipment.
- K. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

### 3.2 PREPARATION

- A. Prepare a TAB plan that includes the following:
  - 1. Equipment and systems to be tested.
  - 2. Strategies and step-by-step procedures for balancing the systems.
  - 3. Instrumentation to be used.
  - 4. Sample forms with specific identification for all equipment.

- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
  - 1. Airside:
    - a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
    - b. Duct systems are complete with terminals installed.
    - c. Volume, smoke, and fire dampers are open and functional.
    - d. Clean filters are installed.
    - e. Fans are operating, free of vibration, and rotating in correct direction.
    - f. Variable-frequency controllers' startup is complete and safeties are verified.
    - g. Automatic temperature-control systems are operational.
    - h. Ceilings are installed.
    - i. Windows and doors are installed.
    - j. Suitable access to balancing devices and equipment is provided.

### 3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
- 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. After testing and balancing, install test ports and duct access doors.
  - 3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish.
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

### 3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check dampers for proper position to achieve desired airflow path.

- H. Check for airflow blockages.
- I. Check condensate drains for proper connections and functioning.
- J. Check for proper sealing of air-handling-unit components.
- K. Verify that air duct system is sealed as specified.

### 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. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
    - b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
    - c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
    - d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
  - 2. Measure fan static pressures as follows:
    - a. Measure static pressure directly at the fan outlet or through the flexible connection.
    - b. Measure static pressure directly at the fan inlet or through the flexible connection.
    - c. Measure static pressure across each component that makes up the air-handling system.
    - d. Report artificial loading of filters at the time static pressures are measured.
  - 3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
  - 4. Obtain approval from Construction Manager for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
  - 5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
  - 1. Measure airflow of submain and branch ducts.
  - 2. Adjust submain and branch duct volume dampers for specified airflow.
  - 3. Re-measure each submain and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
  - 1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
  - 2. Measure inlets and outlets airflow.
  - 3. Adjust each inlet and outlet for specified airflow.
  - 4. Re-measure each inlet and outlet after they have been adjusted.
- D. Verify final system conditions.
  - 1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
  - 2. Re-measure and confirm that total airflow is within design.
  - 3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
  - 4. Mark all final settings.

5. Test system in economizer mode. Verify proper operation and adjust if necessary.
6. Measure and record all operating data.
7. Record final fan-performance data.

### 3.6 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. Phase and hertz.
  5. Nameplate and measured voltage, each phase.
  6. Nameplate and measured amperage, each phase.
  7. Starter size and thermal-protection-element rating.
  8. Service factor and frame size.

### 3.7 PROCEDURES FOR CONDENSING UNITS

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record fan and motor operating data.

### 3.8 DUCT LEAKAGE TESTS

- A. Witness the duct pressure testing performed by Installer.
- B. Verify that proper test methods are used and that leakage rates are within specified tolerances.
- C. Report deficiencies observed.
- D. Ductwork that initially fails these tests shall be replaced, modified, resealed, etc. as required to meet the leakage requirement and then re-test to ensure compliance.

### 3.9 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
  1. Supply, Return, and Equipment with Fans: Plus or minus 10 percent.
  2. Exhaust Fans: Plus 10 percent.
  3. Outside Airflow: Plus 10 percent.
  4. Air Outlets and Inlets: Plus or minus 10 percent.
- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

### 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.
  3. Certify validity and accuracy of field data.
- B. Final Report Contents: In addition to certified field-report data, include the following:
1. Fan curves.
  2. Manufacturers' test data.
  3. Field test reports prepared by system and equipment installers.
  4. Other information relative to equipment performance; do not include Shop Drawings and Product Data.
- C. General Report Data: In addition to form titles and entries, include the following data:
1. Title page.
  2. Name and address of the TAB specialist.
  3. Project name.
  4. Project location.
  5. Architect's name and address.
  6. Engineer's name and address.
  7. Contractor's name and address.
  8. Report date.
  9. Signature of TAB supervisor who certifies the report.
  10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
  11. Summary of contents including the following:
    - a. Indicated versus final performance.
    - b. Notable characteristics of systems.
    - c. Description of system operation sequence if it varies from the Contract Documents.
  12. Nomenclature sheets for each item of equipment.
  13. Notes to explain why certain final data in the body of reports vary from indicated values.
  14. Test conditions for fans performance forms including the following:
    - a. Settings for outdoor-, return-, and exhaust-air dampers.
    - b. Conditions of filters.
    - c. Cooling coil, wet- and dry-bulb conditions.
    - d. Fan drive settings including settings and percentage of maximum pitch diameter.
    - e. Settings for supply-air, static-pressure controller.
    - f. Other system operating conditions that affect performance.
- D. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
1. Unit Data:
    - a. Unit identification.
    - b. Location.
    - c. Make and type.
    - d. Model number and unit size.
    - e. Manufacturer's serial number.
    - f. Unit arrangement and class.
    - g. Discharge arrangement.
    - h. Sheave make, size in inches, and bore.
    - i. Center-to-center dimensions of sheave and amount of adjustments in inches.
    - j. Number, make, and size of belts.
    - k. Number, type, and size of filters.
  2. Motor Data:
    - a. Motor make, and frame type and size.
    - b. Horsepower and rpm.
    - c. Volts, phase, and hertz.
    - d. Full-load amperage and service factor.

- e. Sheave make, size in inches, and bore.
  - f. Center-to-center dimensions of sheave and amount of adjustments in inches.
3. Test Data (Indicated and Actual Values):
- a. Total airflow rate in cfm.
  - b. Total system static pressure in inches wg.
  - c. Fan rpm.
  - d. Discharge static pressure in inches wg.
  - e. Filter static-pressure differential in inches wg.
  - f. Preheat-coil static-pressure differential in inches wg.
  - g. Cooling-coil static-pressure differential in inches wg.
  - h. Heating-coil static-pressure differential in inches wg.
  - i. Outdoor airflow in cfm.
  - j. Return airflow in cfm.
  - k. Outdoor-air damper position.
  - l. Return-air damper position.
  - m. Vortex damper position.
- E. Fan Test Reports: For supply, return, and exhaust fans, include the following:
- 1. Fan Data:
    - a. System identification.
    - b. Location.
    - c. Make and type.
    - d. Model number and size.
    - e. Manufacturer's serial number.
    - f. Arrangement and class.
    - g. Sheave make, size in inches, and bore.
    - h. Center-to-center dimensions of sheave and amount of adjustments in inches.
  - 2. Motor Data:
    - a. Motor make, and frame type and size.
    - b. Horsepower and rpm.
    - c. Volts, phase, and hertz.
    - d. Full-load amperage and service factor.
    - e. Sheave make, size in inches, and bore.
    - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
    - g. Number, make, and size of belts.
  - 3. Test Data (Indicated and Actual Values):
    - a. Total airflow rate in cfm.
    - b. Total system static pressure in inches wg.
    - c. Fan rpm.
    - d. Discharge static pressure in inches wg.
    - e. Suction static pressure in inches wg.
- F. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
- 1. Report Data:
    - a. System and air-handling-unit number.
    - b. Location and zone.
    - c. Traverse air temperature in deg F.
    - d. Duct static pressure in inches wg.
    - e. Duct size in inches.
    - f. Duct area in sq. ft.
    - g. Indicated airflow rate in cfm.
    - h. Indicated velocity in fpm.
    - i. Actual airflow rate in cfm.
    - j. Actual average velocity in fpm.
    - k. Barometric pressure in psig.

- G. Instrument Calibration Reports:
  - 1. Report Data:
    - a. Instrument type and make.
    - b. Serial number.
    - c. Application.
    - d. Dates of use.
    - e. Dates of calibration.

### 3.11 VERIFICATION OF TAB REPORT

- A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Architect.
- B. Architect may randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
- D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- E. If TAB work fails, proceed as follows:
  - 1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
  - 2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
  - 3. If the second verification also fails, the design professional may contact AABC Headquarters regarding the AABC National Performance Guaranty.
- F. Prepare test and inspection reports.

### 3.12 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 15790



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## Section 15860 – Split-System Air-Conditioners

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- B. LEED Submittals:
  - 1. Product Data for Credit EA 4: Documentation indicating that equipment and refrigerants comply.
- C. 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.
- D. Samples for Initial Selection: For units with factory-applied color finishes.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Warranty: Sample of special warranty.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

## 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Filters: Two set(s) for each air-handling unit.
  - 2. Gaskets: One set(s) for each access door.
  - 3. Fan Belts: One set(s) for each air-handling unit fan.

## 1.7 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. ASHRAE Compliance:
  - 1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
  - 2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - "Procedures," and Section 7 - "Construction and System Start-up."
- C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

## 1.8 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."
- B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

## 1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period:
    - a. For Compressor: **Five** year(s) from date of Substantial Completion.
    - b. For Parts: **One** year(s) from date of Substantial Completion.
    - c. For Labor: **One** year(s) from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carrier.
2. Trane.
3. York.
4. Lennox.

## 2.2 AIR HANDLING UNITS (5 TONS OR LESS)

### A. Evaporator-Fan Components:

1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
2. Insulation: Faced, glass-fiber duct liner.
3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
4. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements; with refractory ceramic support bushings, automatic-reset thermal cutout, built-in magnetic contactors, manual-reset thermal cutout, airflow proving device, and one-time fuses in terminal box for overcurrent protection.
5. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
6. Fan Motors:
  - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
  - b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
  - c. Wiring Terminations: Connect motor to chassis wiring with plug connection.
7. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
8. Filters: 1" Permanent, cleanable.
9. Condensate Drain Pans:
  - a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.
    - 1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
    - 2) Depth: A minimum of 2 inches deep.
  - b. Single-wall, stainless-steel sheet.
  - c. Double-wall, galvanized-steel sheet with space between walls filled with foam insulation and moisture-tight seal.
  - d. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on both ends of pan.
    - 1) Minimum Connection Size: NPS 1.
  - e. Pan-Top Surface Coating: Asphaltic waterproofing compound.
  - f. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.

## 2.3 CONDENSING UNITS (5 TONS OR LESS)

### A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
  - a. Compressor Type: Scroll.
  - b. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
  - c. Refrigerant Charge: R-410A.
  - d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.
3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.
6. Low Ambient Kit: Permits operation down to 45 deg F.
7. Mounting Base: Polyethylene.

## 2.4 ACCESSORIES

- A. Control equipment and sequence of operation are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC" and Section 230993.11 "Sequence of Operations for HVAC DDC."
- B. Thermostat: Low voltage with subbase to control compressor and evaporator fan.
- C. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:
  1. Compressor time delay.
  2. 24-hour time control of system stop and start.
  3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
  4. Fan-speed selection including auto setting.
- D. Automatic-reset timer to prevent rapid cycling of compressor.
- E. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.
- F. Drain Hose: For condensate.
- G. Additional Monitoring:
  1. Monitor constant and variable motor loads.
  2. Monitor variable-frequency-drive operation.
  3. Monitor economizer cycle.
  4. Monitor cooling load.
  5. Monitor air distribution static pressure and ventilation air volumes.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install roof-mounted, compressor-condenser components on equipment supports specified in Section 077200 "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.
- D. Equipment Mounting:
  - 1. Install ground-mounted, compressor-condenser components on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
  - 2. Install ground-mounted, compressor-condenser components on polyethylene mounting base.
  - 3. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
  - 4. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."
- E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

### 3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
  - 1. Water Coil Connections: Comply with requirements specified in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties." Connect hydronic piping to supply and return coil connections with shutoff-duty valve and union or flange on the supply connection and with throttling-duty valve and union or flange on the return connection.
  - 2. Remote, Water-Cooled Condenser Connections: Comply with requirements specified in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties." Connect hydronic piping to supply and return connections with shutoff-duty valve and union or flange on the supply connection and with throttling-duty valve and union or flange on the return connection.
- B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.
- C. Duct Connections: Duct installation requirements are specified in Section 233113 "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Section 233300 "Air Duct Accessories."

### 3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

- 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. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.

#### 3.4 STARTUP SERVICE

- A. Perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.

#### 3.5 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 15860

## Section 16050 – Basic Electrical Materials And Methods

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Supporting devices for electrical components.
  - 2. Electricity-metering components.
  - 3. Concrete equipment bases.
  - 4. Touchup painting.

#### 1.2 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. FMC: Flexible metal conduit.
- C. IMC: Intermediate metal conduit.
- D. LFMC: Liquidtight flexible metal conduit.
- E. RNC: Rigid nonmetallic conduit.

#### 1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

#### 1.4 COORDINATION

- A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
  - 1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
- C. Coordinate electrical service connections with buildings and grounds.
- D. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.





- E. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.
- F. Coordinate connecting to all equipment with equipment provider. This includes mechanical, plumbing, owner provided and contractor provided equipment. Contractor to refer to equipment installation documents prior to any rough-in.
- G. Contractor to coordinate with door hardware provider, architect and owner prior to installation of any devices associated with doors to verify door operational requirement, placement of proximity readers, motion sensors, door switches, fire alarm control, magnetic locks, hold open devices, etc..
- H. Contractor to coordinate with architectural millwork shop drawings prior to rough-in for locations of under counter lighting to be installed in and around millwork. No receptacles shall be installed in an enclosed cabinet unless noted on the drawings. Outlets for refrigerators, microwaves, etc. shall be installed in the space identified on the millwork shop drawings.
- I. Contractor shall not penetrate any stair wall assemble with conduit, boxes, cabling and the like, except for items that serve the stairwell.
- J. The contractor shall label the main service disconnecting means with the maximum available fault current shall be listed on the device to meet the requirements of NFPA 70:110.24. The labeling shall be engraved plastic. The maximum available fault current shall be obtained from the electrical utility for the secondary side of the utility transformer.

## PART 2 - PRODUCTS

### 2.1 SUPPORTING DEVICES

- A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.
- B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
- C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch- (14-mm-) diameter slotted holes at a maximum of 2 inches (50 mm) o.c., in webs.
- D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.
- E. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.
- F. Expansion Anchors: Carbon-steel wedge or sleeve type.
- G. Toggle Bolts: All-steel springhead type.
- H. Powder-Driven Threaded Studs: Heat-treated steel.

### 2.2 EQUIPMENT FOR ELECTRICITY METERING BY CONTRACTOR

- A. Meter: Contractor shall provide metering per the local utility. Contractor shall provide all necessary enclosures, meter cans, etc. per the local utility requirements including any fees associated with the service.

## 2.3 CONCRETE BASES

- A. Concrete: 3000-psi (20.7-MPa), 28-day compressive strength as specified in Division 3

## 2.4 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.

# PART 3 - EXECUTION

## 3.1 ELECTRICAL EQUIPMENT INSTALLATION

- A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.
- B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Right of Way: Give to raceways and piping systems installed at a required slope.

## 3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- B. Dry Locations: Steel materials.
- C. Support Clamps for PVC Raceways: Click-type clamp system.
- D. Selection of Supports: Comply with manufacturer's written instructions.
- E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb (90-kg) design load.

## 3.3 SUPPORT INSTALLATION

- A. Install support devices to securely and permanently fasten and support electrical components.
- B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

- C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
- D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.
- E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.
- F. Install 1/4-inch- (6-mm-) diameter or larger threaded steel hanger rods, unless otherwise indicated.
- G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch (38-mm) and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.
- H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
- I. Simultaneously install vertical conductor supports with conductors.
- J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches (610 mm) from the box.
- K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.
- L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
  - 1. Wood: Fasten with wood screws.
  - 2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
  - 3. New Concrete: Concrete inserts with machine screws and bolts.
  - 4. Existing Concrete: Expansion bolts.
  - 5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
  - 6. Steel: Welded threaded studs or spring-tension clamps on steel.
    - a. Field Welding: Comply with AWS D1.1.
  - 7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
  - 8. Light Steel: Sheet-metal screws.
  - 9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

### 3.4 FIRESTOPPING AND FIRE RATED WALLS/CEILINGS/FLOORS

- A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 7.
- B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

### 3.5 CONCRETE BASES

- A. Provide a concrete base for all floor mounted equipment. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

### 3.6 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

### 3.7 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.

### 3.8 CLEANING AND PROTECTION

- A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
- B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 16050

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## Section 16060 – Grounding And Bonding

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes methods and materials for grounding systems and equipment.
  - 1. Underground grounding.
  - 2. Common ground bonding with lightning protection system.

#### 1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

### PART 2 - PRODUCTS

#### 2.1 CONDUCTORS

- A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
  - 1. Solid Conductors: ASTM B 3.
  - 2. Stranded Conductors: ASTM B 8.
  - 3. Tinned Conductors: ASTM B 33.
  - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
  - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
  - 6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
  - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
- C. Bare Grounding Conductor and Conductor Protector for Wood Poles:
  - 1. No. 4 AWG minimum, soft-drawn copper.
  - 2. Conductor Protector: Half-round PVC or wood molding. If wood, use pressure-treated fir or cypress or cedar.

- D. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches by 24" minimum in cross section, unless otherwise indicated; with insulators.

## 2.2 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
  - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

## 2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet (19 mm by 3 m) in diameter.

## 2.4 GROUND ACCESS WELLS

- A. Molded high density polyethylene well with 9" diameter twist-lock cover and locking bolt. Two knock-outs (mouse holes) for routing conductor to inside. Harger #GAW910 or equal.

# PART 3 - EXECUTION

## 3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
  - 1. Bury at least 24 inches below grade.
  - 2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- D. 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, minimum, from wall 6 inches 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.

E. 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 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits

D. Pad-Mounted Transformers and Switches: The following is a minimum if the utility company does not have requirements, otherwise meet the utility company requirements. Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the foundation.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
9. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.
10. X-ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.



- C. **Air-Duct Equipment Circuits:** Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- D. **Water Heater, Heat-Tracing, and Antifrost Heating Cables:** Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- E. **Isolated Grounding Receptacle Circuits:** Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
- F. **Isolated Equipment Enclosure Circuits:** For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
- G. **Signal and Communication Equipment:** For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
  - 1. **Service and Central Equipment Locations and Wiring Closets:** Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
  - 2. **Terminal Cabinets:** Terminate grounding conductor on cabinet grounding terminal.
- H. **Metal Poles Supporting Outdoor Lighting Fixtures:** Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

### 3.4 INSTALLATION

- A. **Grounding Conductors:** Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. **Common Ground Bonding with Lightning Protection System:** Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. **Ground Rods:** Drive 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.
  - 3. Install ground access well with cover for each ground rod (mounted flush with finished grade).

- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
  2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
  3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.
- E. Grounding and Bonding for Piping:
1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
  2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
  3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.
- G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.
- H. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each indicated item, extending around the perimeter of building as indicated on detail or drawings.
1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
  2. Bury ground ring not less than 24 inches from building foundation.
- I. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, using a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.
1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
  2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to grounding electrode external to concrete.

### 3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
1. After installing grounding system but before permanent electrical circuits have 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 individual ground rods. Make tests at ground rods before any conductors are connected.

- a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
  - b. Perform tests by fall-of-potential method according to IEEE 81.
3. Prepare dimensioned drawings locating each test well, ground rod and ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- B. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.
  2. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 5 ohms.
  3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
  4. Manhole Grounds: 10 ohms.
- C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 16060

## Section 16075 – Electrical Identification

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.

#### 1.3 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Schedule of Nomenclature: An index of electrical equipment and system components used in identification signs and labels.
- C. Samples: For each type of label and sign to illustrate color, lettering style, and graphic features of identification products.

#### 1.4 QUALITY ASSURANCE

- A. Comply with ANSI C2.
- B. Comply with NFPA 70 for color-coding.

### PART 2 – PRODUCTS

#### 2.1 RACEWAY AND CABLE LABELS

- A. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide (0.08 mm thick by 25 to 51 mm wide).
- B. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

#### 2.2 NAMEPLATES AND SIGNS

- A. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.

- B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. in. (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.
  - 1. Engraved legend with black letters on white face.
  - 2. Punched or drilled for mechanical fasteners.
- C. Baked-Enamel Signs for Interior Use: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for the application. 1/4-inch (6.4-mm) grommets in corners for mounting.
- D. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

### 2.3 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Formulated for the type of surface and intended use.
  - 1. Primer for Galvanized Metal: Single-component acrylic vehicle formulated for galvanized surfaces.
  - 2. Primer for Concrete Masonry Units: Heavy-duty-resin block filler.
  - 3. Primer for Concrete: Clear, alkali-resistant, binder-type sealer.
  - 4. Enamel: Silicone-alkyd or alkyd urethane as recommended by primer manufacturer.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment. Not in areas exposed to public view.
- B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.
- C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before applying.
- E. Install painted identification according to manufacturer's written instructions and as follows:
  - 1. Clean surfaces of dust, loose material, and oily films before painting.
  - 2. Prime surfaces using type of primer specified for surface.
  - 3. Apply one intermediate and one finish coat of enamel.
- F. Color-Coding of Secondary Phase Conductors: Use the following colors for service feeder and branch-circuit phase conductors:

1. Conductor Color Code:

Phase	120/240 Volts Delta	120/208 Volts	277/480 Volts	120 V Undergrounded (Isolated Power)
A	Black	Black	Yellow	Orange
B	Orange (High Leg)	Red	Orange	Brown
C	Blue	Blue	Brown	Yellow
Neutral	White	White	Grey	-----
Ground	Green	Green	Green	Green

G. Power-Circuit Identification: Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in manholes.

1. Legend: 1/4-inch- (6.4-mm-) steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
2. Tag Fasteners: Nylon cable ties.
3. Band Fasteners: Integral ears.

H. Apply identification to conductors as follows:

1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.
2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.
3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

I. Apply warning, caution, and instruction signs as follows:

1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
2. Emergency Operation: Install engraved laminated signs with white legend on red background with minimum 3/8-inch- (9-mm-) high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

J. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high lettering on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:

1. Panelboards, electrical cabinets, and enclosures.
2. Access doors and panels for concealed electrical items.
3. Electrical switchgear and switchboards.
4. Electrical substations.

5. Emergency system boxes and enclosures.
6. Disconnect switches.
7. Enclosed circuit breakers.
8. Motor starters.
9. Push-button stations.
10. Power transfer equipment.
11. Contactors.
12. Remote-controlled switches.
13. Dimmers.
14. Control devices.
15. Transformers.
16. Power-generating units.
17. Telephone switching equipment.
18. Fire alarm master station or control panel.
19. Security-monitoring master station or control panel.
20. Metering equipment.

END OF SECTION 16075

## Section 16120 – Conductors And Cables

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

#### 1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70-Latest edition or edition enforced by state or local code authority.

### PART 2 - PRODUCTS

#### 2.1 CONDUCTORS AND CABLES

- A. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.
- B. Conductor Material: Copper; stranded conductor or solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.
- C. Conductor Insulation Types: Type THHN-THWN.

#### 2.2 CONNECTORS AND SPLICES

- A. 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 AND INSULATION APPLICATIONS

- 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, and Partitions: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspace: 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 and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.
- H. Fire Alarm Cabling: Plenum rated in plenum areas, exposed above accessible ceilings and in conduit when concealed in finished walls, unaccessible ceilings. Secured per NFPA 70-760.
- I. Low Voltage Cabling: Plenum rated in plenum areas, exposed above accessible ceilings and in conduit when concealed in finished walls, unaccessible ceilings. Secured per NFPA 70-760.
- J. Single Phase Circuits: Provide a dedicated neutral. Sharing of neutrals is not allowed.

### 3.2 INSTALLATION

- A. Conceal cables in conduit in finished walls, unaccessible ceilings, and floors.
- 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. Support cables according to Division 16 Section "Basic Electrical Materials and Methods."
- E. Identify and color-code conductors and cables according to Division 16 Section "Electrical Identification."
- F. Use #10 AWG conductors for 20 amperage 120 circuits when the circuit conductors are longer than 75 feet. Use #10 AWG conductors for 20 amperage 277 circuits when the circuit conductors are longer than 200 feet.

### 3.3 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.
- B. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

END OF SECTION 16120

## Section 16130 – Raceways And Boxes

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
  - 1. Refer to architectural for firestopping materials and installation at penetrations through walls, ceilings, and other fire-rated elements.
  - 2. Division 16 Section "Basic Electrical Materials and Methods" for supports, anchors, and identification products.
  - 3. Division 16 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

#### 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. MC: Metal Clad Cable

#### 1.4 SUBMITTALS

- A. Product Data: For surface raceways, floor boxes, and cabinets.

#### 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-Latest edition or edition enforced by state and local code authority.

## 1.6 COORDINATION

- A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, 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.

## PART 2 - PRODUCTS

### 2.1 METAL WIREWAYS

- A. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 1 or 3R.
- B. 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.
- C. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
- D. Wireway Covers: Hinged type.
- E. Finish: Manufacturer's standard enamel finish.

### 2.2 NONMETALLIC WIREWAYS

- A. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.
- B. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.
- 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. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

### 2.3 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating and two coats of paint. Color by Architect.
- B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

## 2.4 BOXES, ENCLOSURES, AND CABINETS

- A. Floor Boxes: Cast metal, fully adjustable, rectangular with four separate wiring compartments for power outlets, phone and data outlets as indicated on the drawing. Wiremold RFB4E Series, T&B 665 Series of approved equal. Covers shall be UL Listed to U.S. and Canadian safety standards for tile, carpet, wood, bare concrete and terrazzo floors. Covers shall be selected by the architect and shall be of Nickel, Brass, Black, Gray or Bronze.
- B. Poke Thru Floor Boxes: Two hour rated poke thru floor unit with capabilities of four power receptacles and four communication outlets. Provide power, data and phone outlets indicated on drawing. Wiremold RC4, Hubbell PT4 or prior approved equal. Covers shall be selected by the architect and shall be of Nickel, Brass, Black, Gray or Bronze. Poke thru floor boxes are to be utilized on upper floors unless noted otherwise. There must be accessibility in the space below the poke thru box.
- C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- D. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- E. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
  - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
  - 2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.
- F. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.
- G. Exterior Outlet Lock Box: Cast aluminum with self closing door with lock. All units shall be keyed alike. 16 gauge steel housing. Unit for Interior and Exterior installation. Cole: TL-310 or equivalent.
- H. In grade enclosures, boxes and covers are required to conform to all test provisions of the most current ANSI/SCTE 77 "Specification For Underground Enclosure Integrity" for Tier 22 applications. When multiple "Tiers" are specified the boxes must physically accommodate and structurally support compatible covers while possessing the highest Tier rating. All covers are required to have the Tier level rating embossed on the surface. In no assembly can the cover design load exceed the design load of the box. All components in an assembly (box & cover) are manufactured using matched surface tooling. Independent third party verification or test reports stamped by a registered Professional Engineer certifying that all test provisions of this specification have been met are required with each submittal. Cover to be labeled per use of box, ie "Electrical, Communications, etc". Communications pull boxes shall be a minimum of 24" w x 36" l x 36" d.

## 2.5 FACTORY FINISHES

- A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.

## 2.6 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Aluminum Rigid Conduit: ANSI C80.5.

- C. IMC: ANSI C80.6.
- D. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.
- E. Plastic Coated IMC and Fittings: NEMA RN 1.
- F. EMT and Fittings: ANSI C 80.3.
- G. EMT and Fittings: ANSI C80.3.
- H. FMC: Aluminum
- I. LFMC: Flexible steel conduit with PVC jacket.
- J. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

## PART 3 - EXECUTION

### 3.1 RACEWAY APPLICATION

- A. Outdoors:
  - 1. Exposed: Rigid steel or IMC.
  - 2. Concealed: Rigid steel or IMC.
  - 3. Underground, Single Run: RNC.
  - 4. Underground, Grouped: RNC.
  - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  - 6. Boxes and Enclosures: NEMA 250, Type 4.
- B. Indoors:
  - 1. Exposed: EMT in non finished areas. Surface metal raceway in existing finished unaccessible areas unless noted otherwise.
  - 2. Concealed: EMT, MC cable
  - 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
  - 4. Damp or Wet Locations above Ground: Rigid steel conduit.
  - 5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
    - a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.
- C. Minimum Raceway Size: 3/4-inch trade size (DN 21) below grade and 1/2 inch trade size above grade.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.

### 3.2 INSTALLATION

- A. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."

- D. Install temporary closures to prevent foreign matter from entering raceways.
- E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.
- F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- G. Conceal conduit EMT, MC cable within finished walls, ceilings, and floors, unless otherwise indicated.
  - 1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches (50 mm) of concrete cover. Raceway larger than 1" shall be installed below the slab.
  - 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
  - 2. Space raceways laterally to prevent voids in concrete.
  - 3. Run conduit larger than 1-inch trade size (DN 27) parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
- I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
  - 1. Run parallel or banked raceways together on common supports.
  - 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- J. Join raceways with fittings designed and approved for that purpose and make joints tight.
  - 1. Use insulating bushings to protect conductors.
- K. Tighten set screws of threadless fittings with suitable tools.
- L. Terminations:
  - 1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
  - 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.
- N. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- O. Flexible Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
- P. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.

Q. Set floor boxes level and flush with finished floor surface.

R. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 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.

3.4 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION 16130

## Section 16140 – Wiring Devices

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Single and duplex receptacles, ground-fault circuit interrupters and isolated-ground receptacles.
  - 2. Single- and double-pole snap switches.
  - 3. Device wall plates.
  - 4. Pin and sleeve connectors and receptacles.
  - 5. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

#### 1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. PVC: Polyvinyl chloride.
- 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.
  - 1. Receptacles, switches, plates, floor outlets, poke-through assemblies, service poles and multioutlet assemblies.

#### 1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device through one source from a 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 NFPA 70 latest edition or edition enforced by state or local code authority.

## PART 2 – PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Outlets - Duplex:
  - a. Hubbell Incorporated- HBL 5362.
  - b. Leviton Mfg. Company Inc.-5362.
  - c. Pass & Seymour-CRB5362.
  - d. Pass & Seymour-PT5362A (Plug Tail Device).
2. Switches-Single Pole:
  - a. Hubbell- HBL 1221.
  - b. Pass & Seymour – PS20AC1.
  - c. Leviton Mfg. Company, Inc.- 1221-1
3. Switches-Three Pole:
  - a. Hubbell- HBL1223
  - b. Leviton Mfg. Company, Inc.-1223-2.
  - c. Pass & Seymour-PS20AC3.
4. Dimmer Switches Line Voltage:
  - a. Lutron Nova T
  - b. Pass & Seymour CD2000

\* Dimmer must be compatible with Ballast or LED Driver.
5. Dimmer Switches 0-10V:
  - c. Synergy ISD
  - d. Cooper SF10P

\* Dimmer must be compatible with Ballast or LED Driver
6. GFI Receptacles: Weather Resistant
  - a. Hubbell Incorporated- BR20WR
  - b. Leviton Mfg. Company Inc.-WBR20
  - c. Pass & Seymour- WR5362
7. GFI Receptacles: Weather Resistant and Tamper Resistant:
  - a. Hubbell Incorporated-BR2WRTR
  - b. Leviton Mfg. Company Inc.-TWR20
  - c. Pass & Seymour-WR20TR
8. Receptacles: Tamper Resistant:
  - a. Hubbell Incorporated-BR20TR
  - b. Leviton Mfg. Company Inc-TWR20
  - c. Pass & Seymour-TR5362

### 2.2 RECEPTACLES

- A. Straight-Blade-Type Receptacles: Comply with UL 498, 20 amp.

- B. Straight-Blade and Locking Receptacles: Heavy-Duty grade 20 amp.
- C. GFCI Receptacles: Straight blade, feed-through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- (70-mm-) deep outlet box without an adapter.

## 2.3 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.

## 2.4 SWITCHES

- A. Single- and Double-Pole Switches: Comply with UL 20, 20 amp.
- B. Snap Switches: Heavy-Duty grade, quiet type 20 amp, 120/277 volt.
- C. Live Voltage Dimmer: 120V, 2000 watt, slide to-off. Dimmer must be compatible with ballast or driver.
- D. 0-10V Dimmer: 120/277VAC, capable of three way, max wattage 1200 w 120VAC, 150000 277 VAC, Dimmer must be compatible with ballast or driver. 100% to 1% continuo

## 2.5 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
  - 1. Plate-Securing Screws: Metal with head color to match plate finish.
  - 1. Material for Finished Spaces: **As selected by Architect.**
  - 2. Material for Unfinished Spaces: Galvanized steel.
  - 3. Material for Wet Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

## 2.6 POKE-THROUGH ASSEMBLIES

- A. Description: Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service outlet assembly.
  - 1. Service Outlet Assembly: Flush type with four simplex receptacles and space for four RJ-45 jacks.
  - 2. Larger diameter assembly in subparagraph below is available for four simplex receptacles and four voice and data communication outlets in a single, flush-type service outlet.
  - 3. Size: Selected to fit nominal 4-inch (100-mm) cored holes in floor and matched to floor thickness.
  - 4. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
  - 5. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors; and a minimum of four, 4-pair, Category 6 voice and data communication cables.

## 2.7 FINISHES

- A. Color:
  - 1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70.2.
  - 2. Wiring Devices Connected to Emergency Power System: Red.

## PART 3 – EXECUTION

### 3.1 INSTALLATION

- A. Install devices and assemblies level, plumb, and square with building lines.
- B. 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, multigang wall plates.
- C. Remove wall plates and protect devices and assemblies during painting.
- D. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.
- E. Install weather resistant receptacles in damp and wet locations per N.E.C. requirements.
- F. Install tamper resistant receptacles in homes, apartments, hotel rooms and daycares per N.E.C. requirements.

### 3.2 CONNECTIONS

- A. Ground equipment according to Division 16 Section "Grounding and Bonding."
- B. Connect wiring according to Division 16 Section "Conductors and Cables."
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

### 3.3 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
  - 1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
  - 2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 16140

# Section 16146 – Lighting Control Devices

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. This Section includes the following lighting control devices:
  - 1. Time switches.
  - 2. Indoor photoelectric switches.
  - 3. Indoor occupancy sensors.
  - 4. Outdoor motion sensors.
  - 5. Lighting contactors.
  - 6. Emergency shunt relays.
- B. Related Sections include the following:
  - 1. Division 16 Section "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

### 1.3 DEFINITIONS

- A. LED: Light-emitting diode.
- B. PIR: Passive infrared.

### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show installation details for occupancy and light-level sensors.
  - 1. Interconnection diagrams showing field-installed wiring.
  - 2. Layout of all devices on floor plan. Work to be done in electronic form such as audocad. Manufacture shall provide a design to accommodate proper coverage through out.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

## 1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Color of all wall mounted devices of this sections shall match color of devices and plates of the wiring device section.

## 1.6 COORDINATION

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression system, and partition assemblies.

## PART 2 - PRODUCTS

### 2.1 TIME SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Grasslin Controls Corporation; a GE Industrial Systems Company.
  - 2. Intermatic, Inc.
  - 3. Leviton Mfg. Company Inc.
  - 4. Lightolier Controls; a Genlyte Company.
  - 5. Lithonia Lighting; Acuity Lighting Group, Inc.
  - 6. Paragon Electric Co.; Invensys Climate Controls.
  - 7. Square D; Schneider Electric.
  - 8. TORK.
  - 9. Touch-Plate, Inc.
  - 10. Watt Stopper (The).
- B. Electronic Time Switches: Electronic, solid-state programmable units with alphanumeric display; complying with UL 917.
  - 1. Contact Configuration: DPDT.
  - 2. Contact Rating: 30-A inductive or resistive, 240-V ac.
  - 3. Program: 8 on-off set points on a 24-hour schedule and an annual holiday schedule that overrides the weekly operation on holidays.
  - 4. Programs: 2 channels; each channel shall be individually programmable with 8 on-off set points on a 24-hour schedule.
  - 5. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program on selected channels.
  - 6. Astronomic Time: All channels.
  - 7. Battery Backup: For schedules and time clock.
- C. Electromechanical-Dial Time Switches: Type complying with UL 917.
  - 1. Contact Configuration: DPDT.
  - 2. Contact Rating: 30-A inductive or resistive, 240-V ac.
  - 3. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
  - 4. Astronomic time dial.
  - 5. Eight-Day Program: Uniquely programmable for each weekday and holidays.

6. Skip-a-day mode.
7. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.

## 2.2 OUTDOOR PHOTOELECTRIC SWITCHES

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. Area Lighting Research, Inc.; Tyco Electronics.
2. Grasslin Controls Corporation; a GE Industrial Systems Company.
3. Intermatic, Inc.
4. Lithonia Lighting; Acuity Lighting Group, Inc.
5. GreenGate.
6. Paragon Electric Co.; Invensys Climate Controls.
7. Square D; Schneider Electric.
8. TORK.
9. Touch-Plate, Inc.
10. Watt Stopper (The).

B. Description: Solid state, with DPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.

1. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lx), with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.
2. Time Delay: 15-second minimum, to prevent false operation.
3. Surge Protection: Metal-oxide varistor, complying with IEEE C62.41.1, IEEE C62.41.2, and IEEE 62.45 for Category A1 locations.
4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

C. Description: Solid state, with DPST dry contacts rated for 1800 VA to operate connected load, relay, or contactor coils; complying with UL 773.

1. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lx), with an adjustment for turn-on and turn-off levels within that range.
2. Time Delay: 30-second minimum, to prevent false operation.
3. Lightning Arrester: Air-gap type.
4. Mounting: Twist lock complying with IEEE C136.10, with base.

## 2.3 INDOOR OCCUPANCY SENSORS

A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hubbell Lighting.
2. Leviton Mfg. Company Inc.
3. Lithonia Lighting; Acuity Lighting Group, Inc.
4. GreenGate.
5. Sensor Switch, Inc.
6. Watt Stopper (The).

- B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.
1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
  2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
  3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
  4. Mounting:
    - a. Sensor: Suitable for mounting in any position on a standard outlet box.
    - b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
    - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
  5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
  6. Bypass Switch: Override the on function in case of sensor failure.
  7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lx); keep lighting off when selected lighting level is present.
  8. Wall mounted devices color shall match color selected for switches and receptacles. Refer to other sections in specifications.
  9. Meet Nema WD 7-2011 requirements.
- C. PIR Type: Ceiling mounting; detect occupancy by sensing a combination of heat and movement in area of coverage.
1. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm).
  2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
  3. Detection Coverage (Corridor): Detect occupancy within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling.
- D. Ultrasonic Type: Ceiling mounting; detect occupancy by sensing a change in pattern of reflected ultrasonic energy in area of coverage.
1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
  2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. (56 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
  3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
  4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. (186 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
  5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling in a corridor not wider than 14 feet (4.3 m).
- E. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on-off functions shall be selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.

F. System and Design Requirements:

1. Products supplied shall be from a single manufacturer that has been continuously involved in manufacturing of occupancy sensors for a minimum of five (5) years. Mixing of manufacturers shall not be allowed.
2. All components shall be U.L. listed, offer a five (5) year warranty and meet all state and local applicable code requirements.
3. Products shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.
4. The objective of this section is to ensure the proper installation of the occupancy sensor based lighting control system so that lighting is turned off automatically after reasonable time delay when a room or area is vacated by the last person to occupy said room or area.
5. The occupancy sensor based lighting control shall accommodate all conditions of space utilization and all irregular work hours and habits
6. Where specified, sensor shall have an internal additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging and other control options. Sensors utilizing separate components or specially modified units to achieve this function are not acceptable.
7. Meet Nema WD 7-2011 requirements.

## 2.4 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allen-Bradley/Rockwell Automation.
2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
3. Eaton Electrical Inc.; Cutler-Hammer Products.
4. GE Industrial Systems; Total Lighting Control.
5. Grasslin Controls Corporation; a GE Industrial Systems Company.
6. Hubbell Lighting.
7. Lithonia Lighting; Acuity Lighting Group, Inc.
8. MicroLite Lighting Control Systems.
9. Square D; Schneider Electric.
10. TORK.
11. Touch-Plate, Inc.
12. Watt Stopper (The).

B. Description: Electrically operated and mechanically held, combination type with nonfused disconnect, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.



4. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.

## 2.5 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 16 Section "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 16 Section "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 16 Section "Low-Voltage Electrical Power Conductors and Cables."

## PART 3 - EXECUTION

### 3.1 SENSOR INSTALLATION

- A. It shall be the contractor's responsibility to locate and aim sensors in the correct location required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas per the manufacturer's recommendations. Rooms shall have ninety (90) to one hundred (100) percent coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room(s). The drawings indicate only the rooms which are to be provided with sensors. The contractor shall provide sensors as required to properly and completely cover the respective room.
- B. It is the contractor's responsibility to arrange a pre-installation meeting with manufacturer's factory authorized representative, at owner's facility, to verify placement of sensors and installation criteria.
- C. It is the contractor's responsibility to arrange a pre-installation meeting with manufacturer's factory authorized representative, at owner's facility, to verify placement of sensors and installation criteria.
- D. Contractor's work to include all labor, materials, tools, appliances, control hardware, sensor, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational occupancy sensor lighting control system, as described herein. Drawings may indicate the room in which occupancy sensor control is required. The contractor and manufacture shall provide a device to provide proper coverage of the area.

### 3.2 CONTACTOR INSTALLATION

- A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

### 3.3 WIRING INSTALLATION

- A. Wiring Method: Comply with Division 16 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size shall be **1/2 inch (13 mm)**.

- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

### 3.4 IDENTIFICATION

- A. Identify components and power and control wiring according to Division 16 Section "Identification for Electrical Systems."
  - 1. Identify controlled circuits in lighting contactors.
  - 2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

### 3.5 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
  - 1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
  - 2. Operational Test: Verify operation of each lighting control device, and adjust time delays.
- B. Lighting control devices that fail tests and inspections are defective work.
- C. Upon completion of the installation, the system shall be completely commissioned by the manufacturer's factory authorized technician who will verify all adjustments and sensor placement to ensure a trouble-free occupancy-based lighting control system.

### 3.6 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

### 3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 16146

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## Section 16410 – Enclosed Switches And Circuit Breakers

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes individually mounted enclosed switches and circuit breakers used for the following:
  - 1. Feeder and branch-circuit protection.
  - 2. Motor and equipment disconnecting means.

#### 1.3 DEFINITIONS

- A. GFCI: Ground-fault circuit interrupter.
- B. RMS: Root mean square.
- C. SPDT: Single pole, double throw.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of switch, circuit breaker, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each switch and circuit breaker.
  - 1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:
    - a. Enclosure types and details for types other than NEMA 250, Type 1.
    - b. Current and voltage ratings.
    - c. Short-circuit current rating.
    - d. UL listing for series rating of installed devices.
    - e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - 2. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
  - 3. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in "Quality Assurance" Article.

## 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- Latest edition or edition enforced by state and local code authority.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

## 1.6 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. 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. Fusible Switches:
    - a. Eaton Corp.; Cutler-Hammer Products, K-Series.
    - b. General Electric Co.; Electrical Distribution & Control Division, TH.
    - c. Siemens Energy & Automation, Inc., VBII.
    - d. Square D Co, 3110.

### 2.2 ENCLOSED SWITCHES

- A. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle.
- B. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD, with clips to accommodate specified fuses, lockable handle with two padlocks, and interlocked with cover in closed position.

### 2.3 ENCLOSURES

- A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.
  - 1. Outdoor Locations: NEMA 250, Type 3R.
  - 2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

### 2.4 FACTORY FINISHES

- A. Manufacturer's standard prime-coat finish ready for field painting.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Basic Electrical Materials and Methods."
- B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.
- C. If the disconnect or enclosed circuit breaker is used as a Main Service Disconnect then the maximum available fault current shall be listed on the device to meet the requirements of NFPA 70:110.24. The labeling shall be engraved plastic. The maximum available fault current shall be obtained from the electrical utility for the secondary side of the utility transformer.

### 3.3 CONNECTIONS

- A. Install equipment grounding connections for switches and circuit breakers with ground continuity to main electrical ground bus.
- B. Install power wiring. Install wiring between switches and circuit breakers, and control and indication devices.
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.
- D. Maintain all necessary clearances per NFPA-70.

### 3.4 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
  - 1. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.
  - 2. Test continuity of each line- and load-side circuit.

### 3.5 ADJUSTING

- A. Set field-adjustable switches and circuit-breaker trip ranges.

### 3.6 CLEANING

- A. On completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 16410

## Section 16442 – Panelboards

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes load centers and panelboards, overcurrent protective devices, and associated auxiliary equipment rated 600 V and less for the following types:
  - 1. Lighting and appliance branch-circuit panelboards.
  - 2. Distribution panelboards.

#### 1.2 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. RFI: Radio-frequency interference.
- D. RMS: Root mean square.
- E. SPDT: Single pole, double throw.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of panelboard, overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- 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. UL listing for series rating of installed devices.
    - e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
    - f. Floor plans indicating all electrical equipment with actual sizes and clearances.
  - 2. Wiring Diagrams: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.
- C. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.
- D. Maintenance Data: For panelboards and components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Contract Closeout," 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.

#### 1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70- Latest edition or edition enforced by state and local code authority.

#### 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. If the switchboard is utilized as a Main Service Disconnect then the maximum available fault current shall be listed on the device to meet the requirements of NFPA 70:110.24. The labeling shall be engraved plastic. The maximum available fault current shall be obtained from the electrical utility for the secondary side of the utility transformer.

### 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. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
    - a. Eaton Corp.; Cutler-Hammer Products, Pow-R-Line Series.
    - b. General Electric Co.; Electrical Distribution & Control Div., Spectra Series, A-Series
    - c. Siemens Energy & Automation, Inc., P1/SE/53
    - d. Square D Co., NQOD, NEHB, I-Line.

#### 2.2 FABRICATION AND FEATURES

- A. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1, to meet environmental conditions at installed location.
  1. Outdoor Locations: NEMA 250, Type 3R.
- B. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
- C. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
- D. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.

- E. Directory Card: Type written, with transparent protective cover, mounted inside metal frame, inside panelboard door.
- F. Bus: Hard-drawn copper, 98 percent conductivity.
- G. Main and Neutral Lugs: Mechanical type suitable for use with conductor material.
- H. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
- I. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.
- J. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

### 2.3 PANELBOARD SHORT-CIRCUIT RATING

- A. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.
  - 1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
  - 2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

### 2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- B. Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

### 2.5 DISTRIBUTION PANELBOARDS

- A. Doors: Front mounted, except omit in fused-switch panelboards; secured with vault-type latch with tumbler lock; keyed alike.
- B. Main Overcurrent Protective Devices: Circuit breaker.
- C. Branch overcurrent protective devices shall be one of the following:
  - 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; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

### 2.6 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
  2. GFCI Circuit Breakers: Single- and two-pole configurations with 5 -mA trip sensitivity.
- B. Molded-Case Circuit-Breaker Features and Accessories. Standard frame sizes, trip ratings, and number of poles.
1. Lugs: Mechanical style, suitable for number, size, trip ratings, and material of conductors.
  2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
- C. All breakers shall be bolt-on.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install panelboards and accessories according to manufactures requirements.
- B. Mounting Heights: Top of trim 74 inches (1880 mm) above finished floor, unless otherwise indicated.
- C. Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- D. Circuit Directory: 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.
- E. Install filler plates in unused spaces.
- F. Provision for Future Circuits at Flush Panelboards: Stub five 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 into raised floor space or below slab not on grade.
- G. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

#### 3.2 IDENTIFICATION

- A. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

#### 3.3 CONNECTIONS

- A. Install equipment grounding connections for panelboards with ground continuity to main electrical ground bus.
- B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### 3.4 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.

### 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 16442

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## Section 16491 – Fuses

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Cartridge fuses rated 600 V and less for use in switches.

#### 1.3 SUBMITTALS

- A. Product Data: Include the following for each fuse type indicated:
  - 1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
  - 2. Fuse size for elevator feeders and elevator disconnect switches.

#### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fuses from a 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 NFPA 70.

#### 1.5 PROJECT CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), 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.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Ferraz Shawmut, Inc.
  - 2. Little Fuse.

### 2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.
- B. End Caps: End caps shall be capable of being tested if fuse is blown.
- C. Indicating Feature: Fuse shall have an indicating feature which clearly indicates when fuse is blown.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 FUSE APPLICATIONS

- A. Motor Branch Circuits: Class RK1, time delay.

### 3.3 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

### 3.4 IDENTIFICATION

- A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 16491

## Section 16511 – Interior Lighting

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 REFERENCES

- A. ANSI/NFPA 70, National Electrical Code
- B. IEEE C62.41, Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits
- C. FCC 47 CFR Part 15, Federal Code Of Regulation (CFR) testing standard for electronic equipment
- D. IESNA LM-79, Electrical and Photometric Measurements of Solid-State Lighting Products
- E. IESNA LM-80, Approved Method for Measuring Lumen Maintenance of LED Light Sources
- F. UL1598, Standard for Safety of Luminaires
- G. NEMA SSL 3-2010, High-Power White LED Binning for General Illumination

#### 1.3 SUMMARY

- A. This Section includes interior lighting fixtures, lighting fixtures mounted on exterior building surfaces, lamps, ballasts, emergency lighting units, and accessories.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of lighting fixture indicated, arranged in order of fixture designation. Include data on features, accessories, and the following:
  - 1. Dimensions of fixtures.
  - 2. Certified results of independent laboratory tests for fixtures and lamps for electrical ratings and photometric data.
  - 3. Certified results of laboratory tests for fixtures and lamps for photometric performance.
  - 4. Emergency lighting unit battery and charger.
  - 5. Fluorescent and high-intensity-discharge ballasts.
  - 6. Types of lamps.
- B. Shop Drawings: Show details of nonstandard or custom fixtures. Indicate dimensions, weights, method of field assembly, components, features, and accessories.
  - 1. Wiring Diagrams: Detail wiring for fixtures and differentiate between manufacturer-installed and field-installed wiring.



- C. Submit product data on luminaires. Product data to include, but not limited to materials, finishes, approvals, photometric performance, and dimensional information.
- D. Maintenance Data: For lighting fixtures to include in maintenance manuals specified in Division 1.

## 1.5 DRAWINGS

- A. The drawings, which constitute a part of these specifications, indicate the general location of the luminaires. Data presented on these drawings is as accurate as preliminary surveys and planning can determine until final equipment selection is made. Accuracy is not guaranteed and field verification of all dimensions, routing, etc., is required.
- B. Photometric layout shall meet or exceed the criteria of the fixtures indicated on drawings.

## 1.6 QUALITY ASSURANCE

- A. Fixtures, Emergency Lighting Units, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- B. Comply with NFPA 70- Latest edition or edition enforced by state and local code authority.
- C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.
- D. LED Luminaires
  - 1. Manufactures of LED luminaires shall demonstrate a suitable testing program incorporating high heat, high humidity and thermal shock test regimens to ensure system reliability and to substantiate lifetime claims.
  - 2. The use of IESNA LM-80 data to predict luminaire lifetime is not acceptable.
  - 3. At time of manufacture, electrical and light technical properties shall be recorded for each luminaire. At a minimum, this should include lumen output, CCT, and CRI. Each luminaire shall utilize a unique serial numbering scheme. Technical properties must be made available for a minimum of 5 years after the date of manufacture.
  - 4. Luminaires shall be provided with a 5 year warranty covering, LEDs, drivers, paint and mechanical component.

## 1.7 COORDINATION

- A. Fixtures, Mounting Hardware, and Trim: Coordinate layout and installation of lighting fixtures with ceiling system and other construction.

## 1.8 WARRANTY

- A. General Warranty: The contractor shall warranty all work for one year after acceptance of project.

## 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 indicated in the Fixture schedule on the drawings.

- B. Manufacture shall submit for prior approval where required at least (10) days prior to bid.
- C. Subject to compliance with these specifications, luminaires shall be as manufactured by manufacture indicated on the drawings or prior approved equivalent.

## 2.2 FIXTURES AND FIXTURE COMPONENTS, GENERAL

- A. Metal Parts: Free from burrs, sharp corners, and edges.
- B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position.

## 2.3 FLUORESCENT LAMP BALLASTS

- A. General Requirements: Unless otherwise indicated, features include the following:
  - 1. Designed for type and quantity of lamps indicated at full light output.
  - 2. Total Harmonic Distortion Rating: Less than 10 percent.
  - 3. Sound Rating: A.
- B. Electronic Ballasts for Linear Lamps: Unless otherwise indicated, features include the following, besides those in "General Requirements" Paragraph above:
  - 1. Encapsulation: Without voids in potting compound.
  - 2. Parallel Lamp Circuits: Multiple lamp ballasts connected to maintain full light output on surviving lamps if one or more lamps fail. 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.
  - 3. Operating Frequency: Ballast shall be high frequency electronic type and operate lamps at a frequency between 42 kHz and 52 kHz to avoid interference with infrared devices and eliminate visible flicker.
  - 4. Ballast shall provide Independent Lamp Operation (ILO) for Programmed Start ballasts allowing remaining lamp(s) to maintain full light output when one or more lamps fail. Ballast shall contain auto restart circuitry in order to restart lamps without resetting power.
  - 5. Ballast shall operate from 60 Hz input source of 120V through 277V or 347V as applicable with sustained variations of +/- 10% (voltage and frequency).
  - 6. Ballast starting voltage shall be equal to or greater than 550v.
- C. Ballasts for Compact Lamps in Recessed Fixtures: Unless otherwise indicated, additional features include the following:
  - 1. Type: Electronic or electromagnetic, fully encapsulated in potting compound.
  - 2. Power Factor: 90 percent, minimum.
  - 3. Operating Frequency: 20 kHz or higher. 42 kHz or higher.
  - 4. Flicker: Less than 5 percent.
  - 5. Lamp Current Crest Factor: Less than 1.7.

## 2.4 EXIT SIGNS

A. Internally Lighted Signs: As follows:

1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum rated lamp life.

2.5 LAMPS

- A. Fluorescent Color Temperature and Minimum Color-Rendering Index: Refer to drawings.
- B. 4 foot lamps shall be 28 watt, 68,000 rated life 12 hour on with instant start ballast and 90,000 12 hour on with programable start. Initial lumens 2650, minimum CRI of 82 and a 96% lumen maintenance. Approved lamp is Philips Energy Advantage.
- C. All fluorescent lamps shall be low mercury.

2.6 LED LUMINAIRES

- A. General: Except as otherwise indicated, provide LED luminaires, of types and sizes indicated on fixture schedules.
- B. Material and specifications for each luminaire are as follows:
1. Each luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply)
  2. Each luminaire shall be rated for a minimum operational life of 50,000 hours and to LM-70 lumen depreciation standards. This life rating must be conducted 40C ambient temperature.
  3. The rated operating temperature range shall be -30°C to +40°C.
  4. Each luminaire is capable of operating above 100°F [37°C], but not expected to comply with photometric requirements at elevated temperatures.
  5. Photometry must be compliant with IESNA LM-79 and shall be conducted at 25°C ambient temperature.
  6. The individual LEDs shall be constructed such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.
  7. Luminaire shall be constructed such that LED modules may be replaced or repaired without replacement of whole luminaire.
  8. Each luminaire shall be listed with Underwriters Laboratory, Inc. under UL1598 for luminaires, or an equivalent standard from a nationally recognized testing laboratory.
- C. Technical Requirements
1. Electrical
    - a. Power Consumption: Maximum power consumption allowed for the luminaire shall be determined by application. The luminaire shall not consume power in the off state.
    - b. Operation Voltage: The luminaire shall operate from a 60 HZ  $\pm$ 3 HZ AC line over a voltage ranging from 108 VAC to 305 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.
    - c. Power Factor: The luminaire shall have a power factor of 0.90 or greater.
    - d. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 20 percent.
    - e. Each Luminaire shall have UL Listed Class II power supplies. Class I power supplies will not be acceptable.
    - f. Operational Performance: The LED circuitry shall prevent visible flicker to the unaided eye over the voltage range specified above.
    - g. RF Interference: LED Drivers must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise.

- h. Drivers shall have a Class A sound rating
- 2. Thermal Management
  - a. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.
  - b. The LED manufacturer's maximum thermal pad temperature for the expected life shall not be exceeded.
  - c. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.
  - d. The luminaire shall have a minimum heat sink surface such that LED manufacturer's maximum junction temperature is not exceeded at maximum rated ambient temperature.
  - e. The heat sink material shall be aluminum

## 2.7 FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 16 Section "Basic Electrical Materials and Methods," for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Rod Hangers: 3/16-inch- (5-mm-) minimum diameter, cadmium-plated, threaded steel rod.
- C. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.
- D. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

## 2.8 FINISHES

- A. Fixtures: Manufacturer's standard, unless otherwise indicated.
  - 1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
  - 2. Metallic Finish: Corrosion resistant.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Fixtures: Set level, plumb, and square with ceiling and walls, and secure according to manufacturer's written instructions and approved submittal materials. Install lamps in each fixture.
- B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for support.
  - 1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches (150 mm) from fixture corners.
  - 2. Fixtures of Sizes Less Than Ceiling Grid: Arrange as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
- C. Suspended Fixture Support: As follows:
  - 1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
  - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.

### 3.2 CONNECTIONS

- A. Ground equipment.
  - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

### 3.3 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Provide instruments to make and record test results.
- C. Tests: As follows:
  - 1. Verify normal operation of each fixture after installation.
  - 2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation.
  - 3. Verify normal transfer to emergency source and retransfer to normal.
  - 4. Report results in writing.
- D. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.
- E. Corrosive Fixtures: Replace during warranty period.

### 3.4 CLEANING AND ADJUSTING

- A. Clean fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.

END OF SECTION 16511

## Section 16521 – Exterior Lighting

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes exterior lighting units with luminaires, lamps, ballasts, poles/support structures, and accessories.

#### 1.3 DEFINITIONS

- A. Lighting Unit: A luminaire or an assembly of luminaires complete with a common support, including pole, post, or other structure, and mounting and support accessories.
- B. Luminaire (Light Fixture): A complete lighting device consisting of lamp(s) and ballast(s), when applicable, together with parts designed to distribute light, to position and protect lamps, and to connect lamps to power supply.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of lighting unit indicated, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:
  - 1. Materials and dimensions of luminaires and poles.
  - 2. Certified results of independent laboratory tests for fixtures and lamps for electrical ratings and photometric data.
  - 3. Certified results of laboratory tests for fixtures and lamps for photometric performance.
  - 4. High-intensity-discharge luminaire ballasts.
  - 5. LED and Driver information.
- B. Shop Drawings: Anchor-bolt templates keyed to specific poles and certified by manufacturer.
- C. Maintenance Data: For lighting units to include in maintenance manuals specified in Division 1.

#### 1.5 QUALITY ASSURANCE

- A. Luminaires and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for their indicated use, location, and installation conditions by a testing agency acceptable to authorities having jurisdiction
- B. Comply with NFPA 70- Latest edition or edition enforced by state and local code authority.

#### 1.6 DELIVERY, STORAGE, AND HANDLING OF POLES

- A. Store poles on decay-resistant treated skids at least 12 inches (300 mm) above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.
- B. Retain factory-applied pole wrappings on metal poles until just before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

## 1.7 WARRANTY

- A. General Warranty: The contractor shall warranty all work for one year after acceptance of the project for HID and fluorescent and (5) year after acceptance of the project for LED.

## 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 indicated in the Fixture schedule on the drawings. Products indicated in the fixture schedule shall meet the requirements of the this specification. Manufacture shall submit for prior approval where required at least (10) days prior to bid.

### 2.2 HID / FLUORESCENT LUMINAIRES

- A. Metal Parts: Free from burrs, sharp corners, and edges.
- B. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position. Provide for door removal for cleaning or replacing lens. Arrange to disconnect ballast when door opens.
- D. High-Intensity-Discharge Ballasts: Comply with ANSI C82.4. Constant wattage autotransformer or regulating high-power-factor type, unless otherwise indicated.
  1. Ballast Fuses: One in each ungrounded supply conductor. Voltage and current ratings as recommended by ballast manufacturer.
  2. Single-Lamp Ballasts: Minimum starting temperature of minus 40 deg C.
  3. Open-circuit operation will not reduce average life.
  4. High-Pressure Sodium Ballasts: Equip with a solid-state igniter/starter having an average life in pulsing mode of 10,000 hours at an igniter/starter case temperature of 90 deg C.
  5. Noise: Uniformly quiet operation, with a noise rating of B or better.

### 2.3 LUMINAIRE SUPPORT COMPONENTS

- A. Wind-Load Strength of Total Support Assembly: Adequate to carry support assembly plus luminaires at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of 110 mph (160 km/h) with a gust factor of 1.3. Support assembly includes pole or other support structures, brackets, arms, appurtenances, base, and anchorage and foundation.

- B. Finish: Match finish of pole/support structure for arm, bracket, and tenon mount materials.
- C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
  - 1. Materials: Will not cause galvanic action at contact points.
  - 2. Mountings: Correctly position luminaire to provide indicated light distribution.
  - 3. Anchor Bolts, Nuts, and Washers: Hot-dip galvanized after fabrication unless stainless-steel items are indicated.
  - 4. Anchor-Bolt Template: Plywood or steel.
- D. Pole/Support Structure Bases: Anchor type with hold-down or anchor bolts, leveling nuts, and bolt covers.
- E. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.
- F. Concrete for Pole Foundations: Comply with "Cast-in-Place Concrete."
  - 1. Design Strength: 3000-psig (20.7-MPa), 28-day compressive strength.

## 2.4 LED LUMINAIRES

- A. General: Except as otherwise indicated, provide LED luminaires, of types and sizes indicated on fixture schedules. The luminaires need to meet the requirements below.
- B. Material and specifications for each luminaire are as follows:
  - 1. Each luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply).
  - 2. Each luminaire shall be rated for a minimum operational life of 50,000 hours at an average operating time of 11.5 hours per night. This life rating must be conducted 40C ambient temperature.
  - 3. The rated operating temperature range shall be -30°C to +40°C.
  - 4. Each luminaire is capable of operating above 100°F [37°C], but not expected to comply with photometric requirements at elevated temperatures.
  - 5. Photometry must be compliant with IESNA LM-79 and shall be conducted at 25°C ambient temperature.
  - 6. The individual LEDs shall be constructed such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.
  - 7. Luminaire shall be constructed such that LED modules may be replaced or repaired without replacement of whole luminaire.
  - 8. Each luminaire shall be listed with Underwriters Laboratory, Inc. under UL1598 for luminaires, or an equivalent standard from a nationally recognized testing laboratory.



## C. Technical Requirements

### 1. Electrical

- a. Power Consumption: Maximum power consumption allowed for the luminaire shall be determined by application. The luminaire shall not consume power in the off state.
- b. Operation Voltage: The luminaire shall operate from a 60 HZ  $\pm$ 3 HZ AC line over a voltage ranging from 108 VAC to 305 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.
- c. Power Factor: The luminaire shall have a power factor of 0.90 or greater.
- d. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 20 percent.
- e. Surge Suppression: The luminaire on-board circuitry shall include fused surge protection devices (SPD) to withstand high repetition noise transients as a result of utility line switching, nearby lightning strikes, and other interference. The SPD shall protect the luminaire from damage and failure for common mode transient peak voltages up to 10 kV (minimum) and transient peak currents up to 5 kA (minimum). SPD shall conform to UL 1449 depending of the components used in the design. SPD performance shall be tested per the procedures in ANSI/IEEE C62.41-1992 (or current edition) for category C (standard). The SPD shall fail in such a way as the Luminaire will no longer operate. The SPD shall be field replaceable.
- f. Each Luminaire shall have integral UL Listed Class II power supplies. Class I power supplies will not be acceptable.
- g. Operational Performance: The LED circuitry shall prevent visible flicker to the unaided eye over the voltage range specified above.
- h. RF Interference: LED Drivers must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise.
- i. Drivers shall have a Class A sound rating.

### 2. Photometric Requirements

- a. Optical Assemblies: LEDs shall be provided with discreet over optical elements to provide IESNA Type II, III, IV or V distributions. Additional distributions for spill light control shall be utilized when light trespass must be mitigated. Mitigation must take place without external shielding elements. Optical assemblies shall have a minimum efficiency of 85% regardless of distribution type. For Type II and Type III distributions street side efficiencies shall be a minimum of 80%. All LEDs and optical assemblies shall be mounted parallel to the ground. All LEDs shall provide the same optical pattern such that catastrophic failures of individual LEDs will not constitute a loss in the distribution pattern.
- b. Illuminance: The illuminance shall not decrease by more than 30% over the expected operating life. The measurements shall be calibrated to standard photopic calibrations.
- c. Light Color/Quality: The luminaire shall have a correlated color temperature (CCT) range of 4,000K to 4,500K. The color rendition index (CRI) shall be 70 or greater. Binning of LEDs shall conform to ANSI/ G. NEMA SSL 3-2010.
- d. Backlight-Uplight-Glare: The luminaire shall not allow more than 10 percent of the rated lumens to project above 80 degrees from vertical. The luminaire shall not allow more than 2.5

percent of the rated lumens to project above 90 degrees from vertical. Backlight and Glare ratings as per fixture schedule and calculated per IESNA TM-15.

### 3. Thermal Management

- a. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.
- b. The LED manufacturer's maximum thermal pad temperature for the expected life shall not be exceeded.
- c. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.
- d. The luminaire shall have a minimum heat sink surface such that LED manufacturer's maximum junction temperature is not exceeded at maximum rated ambient temperature.
- e. The heat sink material shall be aluminum.

### 4. Physical and Mechanical Requirements

- a. The luminaire shall be a single, self-contained device, not requiring on-site assembly for installation. The power supply for the luminaire shall be integral to the unit.
- b. The assembly and manufacturing process for the LED luminaire shall be designed to assure all internal components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.
- c. Luminaires shall be capable of withstanding cyclical loading in (G = Acceleration of Gravity): a minimum peak acceleration level of 3.0 G peak-to-peak sinusoidal loading with the internal driver installed, for a minimum of 100,000 cycles without failure of any luminaire parts. Testing to be performed in three planes: a horizontal plane parallel to the direction of mounting, a horizontal plane perpendicular to the direction of mounting and the vertical plane.
- d. The housing shall be designed to prevent the build up of water on the top of the housing. Exposed heat sink fins shall be oriented so that water can freely run off the luminaire, and carry dust and other accumulated debris away from the unit.
- e. The optical assembly of the luminaire shall be protected against dust and moisture intrusion per the requirements of IP-66 (minimum) to protect all optical components
- f. The electronics/power supply enclosure shall meet the requirements for NEMA/UL wet location.
- g. Each mounted luminaire may be furnished with or without a photoelectric unit receptacle as per fixture schedule.
- h. Door shall be hinged and secured to the housing in a manner to prevent its accidental opening.
- i. The circuit board and power supply shall be contained inside the luminaire. Electrolytic capacitors used in the power supplies shall be rated for -40°F to 220°F (-40°C to +105°C), long life (> 5000 hours), and operated at no more than 70% of their rated voltage, and 70% of rated current.

### 5. Materials

- a. Housings shall be fabricated from materials that are designed to withstand a 3000-hour salt spray test as specified in ASTM Designation: B117.
- b. Each refractor or lens shall be made from UV inhibited high impact plastic such as acrylic and be resistant to scratching.
- c. Polymeric materials (if used) of enclosures containing either the power supply or electronic components of the luminaire shall be made of UL94VO flame retardant materials. The len(s) of the luminaire are excluded from this requirement.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Concrete Foundations: Construct according to Section "Cast-in-Place Concrete."
  1. Comply with details for reinforcement and for anchor bolts, nuts, and washers. Verify anchor-bolt templates by comparing with actual pole bases furnished.
  2. Finish for Parts Exposed to View: Trowel and rub smooth. Comply with Section "Cast-in-Place Concrete" for exposed finish.
- B. Install poles as follows:
  1. Use web fabric slings (not chain or cable) to raise and set poles.
  2. Mount pole to foundation with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.
  3. Secure poles level, plumb, and square.
  4. Grout void between pole base and foundation. Use nonshrinking or expanding concrete grout firmly packed in entire void space.
  5. Use a short piece of 1/2-inch- (13-mm-) diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.
- C. Lamp luminaires with indicated lamps according to manufacturer's written instructions. Replace malfunctioning lamps.

### 3.2 CONNECTIONS

- A. Ground equipment.
  1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.
- B. Ground metal poles/support structures according to Division 16 Section "Grounding."

### 3.3 FIELD QUALITY CONTROL

- A. Inspect each installed unit for damage. Replace damaged units.
- B. Advance Notice: Give dates and times for field tests.
- C. Provide instruments to make and record test results.

- D. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

#### 3.4 CLEANING AND ADJUSTING

- A. Clean units after installation. Use methods and materials recommended by manufacturer.
- B. Contractor to aim any adjustable luminaires per architect, engineer or owner's requirements. Contractor to provide aiming at night and provide all necessary equipment needed to aim luminaires.

END OF SECTION 16521

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