

**HIDALGO COUNTY – PRECINCT NO. 4**

**SPECIFICATIONS**

**FORMS OF CONTRACT, BOND AND PROPOSAL**

**FOR**

**Building Repairs/Renovations, Additions and/or Alterations  
to  
RESTITUTION CENTER at 1124 “M” Road**

**IN**

**EDINBURG, TEXAS**

**COPY NO. \_\_\_\_\_**

**DATED: July 15, 2013**



HIDALGO COUNTY – PRECINCT NO. 4  
BUILDING REPAIRS/RENOVATIONS, ADDITIONS and/or ALTERATIONS  
to  
RESTITUTION CENTER at 1124 “M” Road  
Edinburg, Texas

DOCUMENT 00010

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END OF SECTION



# REQUEST FOR BIDS

TO SUPPLY HIDALGO COUNTY with sealed bids for:

2013-234-08-07-MSS

-HIDALGO COUNTY PRECINCT NO. 4-"Building Repairs/Renovations, Additions and/or Alterations to Restitution Center at 1124 "M" Road in Edinburg, TX".

A **BIDDER'S BOND** from a reliable surety company licensed to operate in the State of Texas or certified Cashier's Check, payable without recourse to the County of Hidalgo, for the amount of not less than **5%** of the total bid shall accompany the bid as guaranty that, if awarded the contract, the bidder will enter into a contract with the County of Hidalgo. Payment and Performance Bonds shall be executed except in the event into a single payment contract with the County of Hidalgo in lieu of a Performance Bond. In the event the total amount bid is \$25,000 or less, the successful contract has the option to enter into a single payment contract with the County of Hidalgo in lieu of a Payment and Performance Bond.

**Bid Packets** may be obtained at the office of the project architect *Steven L McGarraugh AIA*, Dannenbaum Engineering Company, 1109 Nolana Loop -Suite 208, McAllen, TX 78504 (956) 682-3677 for the amount of **\$75.00**. General and/or Prime Contractors submitting bids and/or proposals to the County of Hidalgo shall be refundable.

**PRE-BID CONFERENCE** is scheduled for Monday, July 29, 2013 at 3:00 P.M. at HIDALGO COUNTY PURCHASING DEPARTMENT CONFERENCE ROOM-2812 S. Business Hwy 281, EDINBURG, TEXAS 78539

**UPON SUBMITTING SEALED BID**, bidders are required to properly identify (handwritten, typed or printed) sealed envelope and/or packet as follows: Bidders' name and address on the upper left hand corner of the sealed envelope and/or package and Bid No.:2013-234-08-07-MSS- HIDALGO COUNTY PRECINCT NO. 4 -"Building Repairs/Renovations, Additions and/or Alterations to Restitution Center at 1124 "M" Road in Edinburg, TX" on the lower left hand corner of sealed envelope/and or packet. **OVERNIGHT MAIL MUST ALSO BE PROPERLY LABELED ON THE OUTSIDE OF EXPRESS ENVELOPE OR PACKAGE.**

The sealed bid must contain one (1) original and three (3) copies of bid and must be clearly identified and addressed for delivery to:

**Martha L. Salazar, CPPB, Hidalgo County Purchasing Agent**  
**Hidalgo County Purchasing Department**

US Postal Mail/Courier Address

Hidalgo County New Administration Building  
2812 S. Business Hwy 281  
Edinburg, Texas 78539

Physical Location:

Hidalgo County New Administration Building  
2802 S. Business Hwy. 281  
(Southeast of Canton Rd & Business 281)  
Edinburg, Texas 78539

**BIDS ACCEPTANCE:** Sealed bids will be accepted until **3:00 p.m. on Wednesday August 7, 2013** at which time they will be opened in the Hidalgo County Purchasing Department Conference Room at **Physical Location: 2802 S. Business Hwy 281, Hidalgo County New Administration Building, Edinburg, Texas 78539.** NO FACSIMILES OR LATE ARRIVALS WILL BE ACCEPTED. ANY BID RECEIVED AFTER THAT TIME WILL NOT BE OPENED AND WILL BE RETURNED.

Attention is called to the fact that not less than, the federally determined prevailing (**Davis-Bacon and Related Acts**) wage rate, as issued and contained in the contract documents, must be paid on this project. In addition the successful bidder must ensure that employees and applicants for employment are not discriminated against because of race, color, religion, sex, age, disability or national origin.

**BIDS MAY BE HELD** by the County of Hidalgo for a period not to exceed ninety (90) days from the date of the opening of bids for the purpose of reviewing the bids and investigating the qualifications of bidders, prior to awarding of the contract.

**THE COUNTY** reserves the right to refuse and reject any/all bids and to waive any/all formalities or technicalities, or accept the bids considered the best and most advantageous to the County.

Typed-written bidding RFI's shall be faxed to: *Steven L McGarraugh AIA @ (956) 686-1822*. Please call 956-682-3677 to confirm receipt of faxed RFI. RFI's **will not be answered by phone**. NO HAND WRITTEN RFI'S will be processed/answered. All inquiries shall be forwarded by July 31, 2013. Inquiries beyond this date will not be responded. Contact project architect's office for copies of Addenda. All bidders who paid a deposit will be required to return Addenda as part of the Construction Documents in order to receive full deposit refund.

**BY ORDER OF THE COMMISSIONERS COURT OF HIDALGO COUNTY, TEXAS** on this the 17<sup>th</sup> day of July, 2013.

**MARTHA L. SALAZAR, CPPB**  
**HIDALGO COUNTY PURCHASING AGENT**

**REPORT ROAD HAZARDS@1-866-HCR-SAFE OR 1-866-427-7233**





Hidalgo County Purchasing Department  
2812 S. Business Highway 281  
Edinburg, Texas 78539  
(956) 318-2626/ Fax: (956) 318-2629

**HIDALGO COUNTY PRECINCT No. 4**

**“Building Repairs/Renovations, Additions and/or Alterations to Restitution Center at 1124 “M” Road in Edinburg, TX”**

BID No. -2013-234-08-07-MSS

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The above mentioned items shall be found in this RFB packet. Should you find that any of the items are not attached in its entirety please contact Purchasing by calling (956) 318-2626, advise of missing documentation, and Purchasing will forward information either through facsimile or by U.S. Mail.

Thank you.



# REQUEST FOR BIDS

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2013-234-08-07-MSS

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Hidalgo County Purchasing Department**

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Attention is called to the fact that not less than, the federally determined prevailing (**Davis-Bacon and Related Acts**) wage rate, as issued and contained in the contract documents, must be paid on this project. In addition the successful bidder must ensure that employees and applicants for employment are not discriminated against because of race, color, religion, sex, age, disability or national origin.

**BIDS MAY BE HELD** by the County of Hidalgo for a period not to exceed ninety (90) days from the date of the opening of bids for the purpose of reviewing the bids and investigating the qualifications of bidders, prior to awarding of the contract.

**THE COUNTY** reserves the right to refuse and reject any/all bids and to waive any/all formalities or technicalities, or accept the bids considered the best and most advantageous to the County.

Typed-written bidding RFI's shall be faxed to: *Steven L McGarraugh AIA @ (956) 686-1822*. Please call 956-682-3677 to confirm receipt of faxed RFI. RFI's will not be answered by phone. NO HAND WRITTEN RFI'S will be processed/answered. All inquiries shall be forwarded by July 31, 2013. Inquiries beyond this date will not be responded. Contact project architect's office for copies of Addenda. All bidders who paid a deposit will be required to return Addenda as part of the Construction Documents in order to receive full deposit refund.

**BY ORDER OF THE COMMISSIONERS COURT OF HIDALGO COUNTY, TEXAS** on this the 17<sup>th</sup> day of July, 2013.

**MARTHA L. SALAZAR, CPPB  
HIDALGO COUNTY PURCHASING AGENT**

**REPORT ROAD HAZARDS@1-866-HCR-SAFE OR 1-866-427-7233**





PURCHASING DEPARTMENT  
County Of Hidalgo

July 22, 2013

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Re: **HIDALGO COUNTY PRECINCT No. 4** **"Building Repairs/Renovations, Additions and/or Alterations to Restitution Center at 1124 "M" Road in Edinburg, TX"**  
BID No. -2013-234-08-07-MSS

Dear Gentleman/Ladies:

Enclosed please find a Request for Bid (RFB) packet for your review and consideration.

Hidalgo County Purchasing Department welcomes and appreciates your participation in the bid process.

If any further assistance is required, please do not hesitate to call the Purchasing Department 956/318-2626.

Sincerely,

A handwritten signature in blue ink that reads "Martha L. Salazar".

Martha L. Salazar, CPPB  
Hidalgo County Purchasing Agent

MLS/mss

Enclosures





**REQUEST FOR BIDS (RFB)**

**HIDALGO COUNTY PRECINCT No. 4**

**“Building Repairs/Renovations, Additions and/or  
Alterations to Restitution Center at 1124 “M” Road in  
Edinburg, TX”**

**BID No. -2013-234-08-07-MSS**

Acceptance Date: August 7, 2013

Martha L. Salazar, CPPB, Purchasing Agent  
Hidalgo County Purchasing Department

Project Buyer Contact Information:

Moises Salazar, Buyer III  
(956) 292-7000 Ext. 4863  
[moises.salazar@co.hidalgo.tx.us](mailto:moises.salazar@co.hidalgo.tx.us)

Form HCPD-03



1. Sealed bids will be received for **“HIDALGO COUNTY PRECINCT NO. 4 - BUILDING REPAIRS/RENOVATIONS, ADDITIONS AND/OR ALTERATIONS TO RESTITUTION CENTER AT 1124 “M” ROAD IN EDINBURG, TX”** in accordance with the specifications attached as Exhibit "A" hereto. Bids should address all specifications set forth. Bidders may suggest substitutions of features which they feel would be in the best interest of Hidalgo County ("County"). Strong rationale must be presented for any deviation from the specifications. Hidalgo County reserves the right to reject the deviation and its effect on the overall bid.
2. One (1) original and three (3) copies of all bids are required with the bidders name and return address clearly typed/printed on upper left hand corner and the proper notation clearly typed/printed on the lower left hand corner of the envelope and/or package: **“BID-2013-234-08-07-MSS- HIDALGO COUNTY PRECINCT NO. 4-BUILDING REPAIRS/RENOVATIONS, ADDITIONS AND/OR ALTERATIONS TO RESTITUTION CENTER AT 1124 “M” ROAD IN EDINBURG, TX”** and in County's Purchasing Department, physical address: 2802 S. Business Hwy 281, mailing address 2812 S. Business 281 New Administration Building,, Edinburg, Texas, **on or before 3:00 p.m., WEDNESDAY, August 7, 2013.**

**NO FACSIMILES OR LATE ARRIVALS WILL BE ACCEPTED. ANY RFB RECEIVED AFTER THAT TIME WILL NOT BE OPENED AND WILL BE RETURNED. OVERNIGHT MAIL MUST ALSO BE PROPERLY LABELED ON THE OUTSIDE OF EXPRESS ENVELOPE OR PACKAGE WITH REFERENCE TO “REQUEST FOR BIDS -2013-234-08-07-MSS- HIDALGO COUNTY PRECINCT NO. 4 -BUILDING REPAIRS/RENOVATIONS, ADDITIONS AND/OR ALTERATIONS TO RESTITUTION CENTER AT 1124 “M” ROAD IN EDINBURG, TX”.**

WRITTEN QUESTIONS WILL BE ACCEPTED. Written RFI's shall be sent to the office of project architect: Dannenbaum Engineering Company to the attention of, Steve L. McGarraugh, AIA at [Steve.McGarraugh@dannenbaum.com](mailto:Steve.McGarraugh@dannenbaum.com) . Please call 956-682-3677 to confirm receipt RFI. RFI's will not be answered by phone. NO HAND WRITTEN RFI'S will be answered. All inquiries shall be forwarded by **July 31, 2013.** Inquiries beyond this date will not be responded. Contact project engineer for copies of Addenda. All bidders who paid a deposit will be required to return Addenda as part of the Construction Documents in order to receive full deposit refund.

Hidalgo County reserves the right to refuse and reject any/all RFB and to waive any/all formalities or technicalities, or to accept the RFB considered the best and most advantageous to Hidalgo County

3. Hidalgo County reserves the right to: A. separate and accept, or eliminate any item(s) listed under this bid that it deems necessary to accommodate budgetary and/or operational requirements; B. reject any or all bids submitted and further reserves the right to design the evaluation criteria to be used in selecting the lowest and best bid for approval; and C. award the bid to one bidder or to multiple bidders if the County determines it is in its best interest to do so.”
4. The Bidder shall not substitute items named in the bid without the express written



consent of Hidalgo County. Failure of the delivered item(s) to perform as specified, or failure to meet the stated delivery schedule shall release Hidalgo County from all obligations to the contracting party with regard to the item(s) in question. In such event, County may elect to award the contract to the next-lowest responsible bidder, or to reject all bids and re-advertise.

5. For work to be performed at a County owned or operated location, each bidder shall, in its sole discretion, visit the job site before preparing the bid and thoroughly familiarize himself/herself with existing conditions. Bidder should take field dimensions and note all circumstances which affect the dollar amount of the bid.
6. Descriptive specifications are referenced in this document to indicate the general kind and quality of equipment desired by Hidalgo County. Due to various styles and models of equipment, bidders are required to include illustrations, specifications, explanation of warranties, and service data with their bid including catalogue numbers and any necessary references.
7. No bid may be withdrawn within thirty (30) days from the scheduled time to open bids.
8. Proposed prices are to remain firm for a minimum of ninety (90) days after bid opening.
9. Any interpretations, amendments, corrections or changes to this bid document must be in a written addendum and signed by the County Judge or his designee. Addenda will be mailed to all who are known to have received a copy of the Request for Bids. Bidders shall acknowledge receipt of all addenda as a part of their bid.
10. County reserves the right to accept or reject any or all bids.
11. Costs are to be net F.O.B., County Prepaid.
12. County is exempt from Federal Excise Tax, State Tax and Local Tax. Do Not include tax in cost figure. If it is determined that tax was included in the cost figures it will not be included in the tabulation of any awards. Tax exemption certificates will be furnished upon request.
13. Funds for this procurement have been provided through the County budget for this fiscal year only. County, on an annual basis, has the right to reconsider a contract during the budget process for ensuing years if financial resources of County are insufficient to meet the liabilities of said contract. The award of a bid or contract hereunder will not be construed to create a debt of the County which is payable out of funds beyond the current fiscal year.
14. Upon award and prior to execution of a contract, Sole Proprietorships are required to submit a copy of their social security cards to the Hidalgo County Auditor's Office in order to establish an account with the County. All awarded vendors must submit a completed W-9 and a copy of their Federal ID Number Certificate.
15. DELIVERY INSTRUCTIONS:
  - . No deliveries accepted after 3:00 P.M., Monday-Friday.
  - . At least seventy two (72) hours prior notice of delivery must be given to Martha



L. Salazar, Purchasing Agent before delivery will be accepted.

If you need additional information call the office listed below:

Hidalgo County Purchasing Department  
Martha L. Salazar, Purchasing Agent  
(956) 318-2626

16. BILLING AND PAYMENT INSTRUCTIONS:

Invoices must include:

- a) Name and address of successful bidder
- b) Name and address of receiving department or official
- c) Purchase Order Number (if any)
- d) Notation - BID-2013-234-08-07-MSS- HIDALGO COUNTY PRECINCT NO. 4-“BUILDING REPAIRS/RENOVATIONS, ADDITIONS AND/OR ALTERATIONS TO RESTITUTION CENTER AT 1124 “M” ROAD IN EDINBURG, TX” Descriptive information as to the items or services delivered, including product code, item number, quantity, etc.

Discount payments will be considered when offered.

Contact person for Billing and Payment questions:

**Ray Eufrazio, CPA, Hidalgo County Auditor**  
**2802 S. Business Hwy 281**  
**Edinburg, TX 78539**  
**(956) 318-2511**

17. Schedule

Pre-Bid Conference,	3:00 PM	July 29	2013
Bid Opening,	3:00 PM	August 7	2013
Award of Contract			2013
Commence Work or Deliver Products			2013

HIDALGO COUNTY APPROVED HOLIDAYS

2013 YEAR	
New Year's Day	12/31/12 and 01/01/13
Martin Luther King Day	01/21/13
President's Day	02/18/13
Good Friday	03/29/13
Easter	04/01/13
Memorial Day	05/27/13
Independence Day	07/04/13
Labor Day	09/02/13
Columbus Day	10/07/13
Veteran's Day	11/11/13
Thanks Giving Day	11/28/13 and 11/29/13
Christmas Day	12/24/13 and 12/25/13



18. Bid or Performance Bond and Debarment Certification; Payment Under Contract:

. If the contract proposed is for the construction of public works or is for a contract for goods & services exceeding \$100,000, all bidders shall furnish a good and sufficient bid bond in the amount of five percent of the total contract price. A bid bond must be executed with a surety company authorized to do business in Texas. All bidders are also required to furnish a certification or acknowledgment stating that the contractor or vendor is free from suspension or debarment pursuant to federal regulation 45CFR Part 76.

. Together with the signing of a contract or issuance of a purchase order following the acceptance of a bid, and prior to commencement of the actual work, the bidder shall furnish a performance bond to the County for the full amount of the contract, if that contract exceeds \$100,000.

. If the contract is for \$50,000 or less, no money will be paid to the contractor until completion and acceptance of the work or the fulfillment of the purchase obligation to the County, and, if applicable, the receipt by County of satisfactory evidence that all subcontractors and material men have been paid.

. If a contract is for the construction, alteration or repair of public buildings or public works, the contractor *shall* provide a payment bond for a contract in excess of Twenty Five Thousand Dollars (\$25,000.00), as required by Tex. Govt. Code Ch. 2253.

. For requirements contracts, bond requirements are determined by applying the proposed unit price to the estimated quantities included in the specifications.

19. Ethical Standards:

. It shall be a breach of ethics to offer, give or agree to give any elected official, department head or employee, or former elected official, department head or employee, of the County, or for any elected official, department head or employee or former elected official, department head or employee of the County, to solicit, demand, accept or agree to accept from another person, entity or organization, a gratuity or an offer of employment in connection with any decision, approval, disapproval, recommendation, preparation or any part of a program requirement or purchase request, influencing the content of any specification or procurement standard, rendering of advice, investigation, auditing, or in any other advisory capacity in any proceeding or application, request for ruling, determination, claim or controversy, or other particular matter pertaining to any program requirement or a contract or subcontract, or to any solicitation or proposal therefore pending before any department or agency of the County.

. It shall be a breach of ethics for any payment, gratuity or offer of employment to be made by or on behalf of a subcontractor under a contract to the prime contractor or higher tier subcontractor for any contract for the County, or any person associated therewith, as an inducement for the award of a subcontract or order.



No public official shall have an interest in a contract awarded hereunder except in accordance with Tex. Loc. Govt. Code Chapter 171.

• **NOTICE:**

**ALL COMMUNICATIONS BY A VENDOR TO THE COUNTY, ITS OFFICIALS, AND DEPARTMENT HEADS REGARDING THIS PROCUREMENT SHALL BE DONE THROUGH THE HIDALGO COUNTY PURCHASING DEPARTMENT.**

No vendor, its representative, agent, or employee shall engage in private communication with a member of the Hidalgo County Commissioners Court or county department heads regarding any procurement of goods or services by the County from the date that the Bid, RFP, or RFQ is released. No private communication regarding the purchase shall be permitted until the procurement process is complete and a purchase order is granted or a contract is entered into. Members of the commissioners court are required to make a reasonable effort to inform themselves regarding potential procurements and have a duty to inquire of vendors, their representatives or employees, the nature of any private communication being sought prior to engaging in any communication. "Private Communication" means communication with any vendor outside of a posted meeting of the governing body, a regular meeting of a standing or appointed committee, or a negotiation with a vendor which has been specifically authorized by the governing body.

20. Disclosure of Conflict of Interest

Effective January 1, 2006, Chapter 176 of the Texas Local Government Code requires that any vendor, person, consultant or contractor considering doing business with Hidalgo County ("the County") to disclose in the Conflict of Interest Questionnaire (the "CIQ") attached as Exhibit D, the vendor, person, consultant or contractor's affiliation or business relationship that might cause a conflict of interest with the County. By law, the CIQ must be filed with the Hidalgo County Clerk's Office no later than the seventh business day after the date the person becomes aware of facts that require that statement to be filed. The disclosure requirement applies to a person or business who contracts or seeks to contract with Hidalgo County for the sale or purchase of property, goods or service. Any purchase order or contract resulting from this process shall be considered null and void if the successful bidder fails to comply with Texas Local Government Code Chapter 176. Vendors, consultants, contractors and others who desire to conduct business with Hidalgo County are encouraged to refer to Texas Local Government Code Chapter 176 for the details of this law. An offense under Texas Local Government Code Chapter 176 is a Class C Misdemeanor.

Please Submit completed CIQ forms to the Hidalgo County Clerk's Office located at 100 N. Clossner, Edinburg, Texas 78539-Hidalgo County Courthouse  
**COMPLETION AND SUBMISSION OF FORM CIQ IS THE SOLE RESPONSIBILITY OF THE PROSPECTIVE BIDDER.**

21. If, during the life of any contract or bid awarded, the successful bidder's net prices generally available to other customers for items awarded herein are reduced below the contracted price, it is understood and agreed that the benefits of such reduction shall be extended to County.



22. Bids, and all goods and services provided thereunder, shall comply with all federal, state and local laws concerning this type(s) of goods and/or services
23. Minimum Standards For Responsible Prospective Bidders: A prospective bidder must affirmatively demonstrate bidder's responsibility. A prospective bidder, by submitting a bid, represents to County that it meets the following requirements:
- . **Possess and submit a Certificate of Account Status indicating bidder is in "Good Standing" with the Texas Comptroller of Public Accounts if such bidder is incorporated in the State of Texas. If the bidder is not incorporated with the Texas, the bidder must submit the appropriate evidence of filing with the Texas Secretary of State stating that the business is authorized to transact business in Texas.**
  - . Possess or is able to obtain adequate financial resources as required to perform under the bid;
  - . Be able to comply with the required or proposed delivery schedule;
  - . Have a satisfactory record of performance;
  - . Have a satisfactory record of integrity and ethics;
  - . Be otherwise qualified and eligible to receive an award.
24. Successful bidder will pay or cause to be paid, without cost or expenses to County, all FICA, FUTA/SUTA and Federal Income Withholding Taxes of all employees, and all wages and benefits as required by Federal or State law. Successful bidder's officers, agents and/or employees will not be entitled to any benefits of an employee or elected official of County, including, but not limited to, benefits associated with County's civil service system.
25. Any contract award to a successful bidder will be in effect until (a) the contract expires, (b) delivery and acceptance of products, and/or performance of services ordered, or (c) terminated by County with thirty day's written notice prior to cancellation.
26. County reserves the right to enforce performance of any contract awarded hereunder in any manner prescribed by law or deemed to be in the best interest of the County in the event of breach or default by successful bidder; County reserves the right to terminate any contract immediately in the event a successful bidder fails to:
- A. Meet schedules;
  - B. Pay any required fees or taxes; or
  - C. Otherwise perform in accordance with the specifications.
27. Successful bidder shall defend, indemnify and save harmless County and all its elected officials, officers, agents and employees from all suits, actions, or other claims of any character, name and description brought for or on account of any injuries or damages received or sustained by any person, persons, or property on account of any negligent act or fault of the successful bidder, or of any agent, employee, subcontractor or supplier of successful bidder in the execution of, or performance under, any contract which may result from bid award or which arises from any event or casualty happening on or within County premises themselves or happening upon or in any halls, elevators, entrances, stairways or approaches of or to such County facilities. Successful bidder shall pay any judgment with costs which may be obtained against County growing out of such injury or



damages, and shall, upon request, provide a defense to County by counsel reasonably acceptable to County. Successful bidder's indemnity hereunder shall include, but is not limited to, claims relating to patent, copyright or trademark infringement, and the like, arising out of the goods and services provided by successful bidder.

28. Successful bidder shall warrant that all items/services shall conform with the specifications and/or all warranties provided under the Uniform Commercial Code and be free from all defects in material, workmanship and the like. Items supplied under a contract pursuant to this Request for Bids shall be subject to County's approval. Items found to be defective or not meeting specifications shall be replaced by successful bidder within two business days at no expense to County. Items not picked up within one (1) week after notification shall be deemed a donation to County and may be used or disposed of at County's discretion and without waiver of any other rights of County as to the item's nonconformity.
29. *Vendors hereby assigns to purchaser any and all claims for overcharges associated with this contract which arise under the antitrust laws of the United States, 15 USCA, Section 1 et. seq., and which arise under the antitrust laws of the State of Texas, Bus. & Com. Code, Section 15.01, et. seq.*
30. This document and any disputes arising hereunder shall be governed and construed according to the laws of the State of Texas, and will be performable exclusively in Hidalgo County, Texas.
31. The successful bidder shall not assign, sell, transfer or convey its rights under any awarded contract, in whole or in part, without the prior written consent of County.



**BIDDERS ACKNOWLEDGEMENT**  
**Bid for**

HIDALGO COUNTY PRECINCT NO. 4

**“BUILDING REPAIRS/RENOVATIONS, ADDITIONS AND/OR ALTERATIONS TO  
RESTITUTION CENTER AT 1124 “M” ROAD IN EDINBURG, TX”**

**BID-2013-234-08-07-MSS**

To: Martha L. Salazar, CPPB, Purchasing Agent  
Hidalgo County Purchasing Department  
2802 S. Bus. Hwy. 281  
Edinburg, Texas 78539

In accordance with the Specifications, and subject to all laws and regulations of the United States and state and local laws, the undersigned bidder proposes and commits to furnish all labor, equipment, material, software and services as set forth in the documents hereinbefore mentioned. The undersigned bidder further agrees, upon acceptance of its bid, to execute a contract and/or Purchase Order issued by Hidalgo County for performing and completing the work described in the Specifications within the time stated and for the prices proposed in the documents attached hereto and made a part hereof.

Bidder acknowledges receipt of all of the pages of the documents referenced in the Invitation to Bid Checklist presented in connection with this procurement. Bidder understands that Hidalgo County reserves the right to reject any or all bids and further reserves the right to design the evaluation criteria to be used in selecting the lowest and best bid.

Bidder agrees that this bid shall be good and may not be withdrawn for a period of ninety (90) calendar days after the scheduled closing time for receiving bids, as contained in the Specifications.

Respectfully submitted,

Bidder: \_\_\_\_\_  
Address: \_\_\_\_\_  
By: \_\_\_\_\_  
Printed Name: \_\_\_\_\_  
Title: \_\_\_\_\_

(This page must be submitted in response)



**EXHIBIT “C”**  
**Insurance Requirements**  
**Applicable to the Acquisition of Goods and /or Services (other than**  
**Professional Services)**

The Bidder awarded the contract shall furnish proof of insurance, which will also include any subcontractor that is subcontracted by the bidder in at least the following limits, to be in place prior to providing any services under this Contract and to continue at all times in force in effect during the term of this Contract:

1. A Five Hundred Thousand Dollar (\$500,000.00) Comprehensive General Liability insurance policy providing additional coverage to all underlying liabilities of County.
2. Automobile liability insurance policy with limits of at least Three Hundred Thousand Dollars (\$300,000.00) per person and Five Hundred Thousand Dollars (\$500,000.00) per occurrence. Coverage should include injury to or death of persons and property damage claims with limits up to Five Hundred Thousand (\$500,000.00) arising out of the services provided to County hereunder.
3. Uninsured/Underinsured motorist coverage in an amount equal to the bodily injury limits set forth immediately above;
4. Workers compensation insurance in amounts established by Texas law, unless the Bidder is specifically exempted from the Texas Workers Compensation Act, Texas Labor Code Chapter 401, et. seq.

**Hidalgo County will only accept certificates of insurance on an Acord form (as attached hereto).** Certificates of insurance naming County as an additional insured shall be submitted to County for approval prior to any services being performed by Contractor. Each policy of insurance required hereunder shall extend for a period equivalent to, or longer than the term of the Contract, and any insurer hereunder shall be required to give at least thirty (30) days written notice to the County prior to the cancellation of any such coverage on the termination date, or otherwise. This Contract shall be automatically suspended upon the cancellation, or other termination, of any required policy of insurance hereunder, and such suspension shall continue until evidence adequate replacement coverage is provided to County. If replacement coverage is not provided within thirty (30) days following suspension of the Contract, this Contract shall automatically terminate.



**ACORD** **CERTIFICATE OF INSURANCE** DATE (MM/DD/YY)

PRODUCER \_\_\_\_\_ THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

**INSURERS AFFORDING COVERAGE**

INSURED \_\_\_\_\_

INSURER A: \_\_\_\_\_

INSURER B: \_\_\_\_\_

INSURER C: \_\_\_\_\_

INSURER D: \_\_\_\_\_

INSURER E: \_\_\_\_\_

**COVERAGES**

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THEIR TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS
A	<b>GENERAL LIABILITY</b>				EACH OCCURRENCE \$
	<input type="checkbox"/> COMMERCIAL GENERAL LIABILITY				FIRE DAMAGE (Any one fire) \$
	<input type="checkbox"/> CLAIMS MADE OCCUR				MEDICAL (Any one person) \$
	<input type="checkbox"/> OWNER'S & CONT PROT				PERSONAL & ADV INJURY \$
	<input type="checkbox"/> OWNER'S PROTECTIVE LIABILITY				ANNUAL AGGREGATE \$
	<input type="checkbox"/> GEN'L AGGREGATE LIMIT APPLIES PER POLICY PROJECT <input type="checkbox"/> LOC				PRODUCTS - COMP/OP AGG \$
B	<b>AUTOMOBILE LIABILITY</b>				COMBINED SINGLE LIMIT (E&A accident) \$
	<input type="checkbox"/> ANY AUTO				BODILY INJURY (Per person) \$
	<input type="checkbox"/> ALL OWNED AUTOS				BODILY INJURY (Per accident) \$
	<input type="checkbox"/> SCHEDULED AUTOS				PROPERTY DAMAGE (Per accident) \$
	<input type="checkbox"/> HIRED AUTOS				
<input type="checkbox"/> NON-OWNED AUTOS					
	<b>GARAGE LIABILITY</b>				AUTO ONLY - EA ACCIDENT \$
	<input type="checkbox"/> ANY AUTO				OTHER THAN AUTO ONLY EA ACC \$
					AGG \$
C	<b>EXCESS LIABILITY</b>				EACH OCCURRENCE \$
	<input type="checkbox"/> OCCUR <input type="checkbox"/> CLAIMS MADE				AGGREGATE \$
	<input type="checkbox"/> DEDUCTIBLE				\$
	<input type="checkbox"/> RETENTION \$				\$
D	<b>WORKERS COMPENSATION AND EMPLOYER'S LIABILITY</b>				WC STATU. <input type="checkbox"/> OTHER \$
					E L EACH ACCIDENT \$
					E L DISEASE-EA EMPLOYEE \$
	<b>OTHER</b>				E L DISEASE POLICY LIMIT \$

DESCRIPTION OF OPERATIONS / LOCATION / VEHICLES / EXCLUSIONS ADDED BY ENDORSEMENT / SPECIAL PROVISIONS  
 County of Hidalgo shall be named as additional Insured on all Commercial General Liability policies.

CERTIFICATE HOLDER <b>Hidalgo County Attn: Purchasing Department 2812 S Highway Bus. 281 Edinburg, Texas 78539</b>	ADDITIONAL INSURED; INSURER LETTER:	CANCELLATION SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL <b>30</b> DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES. AUTHORIZED REPRESENTATIVE
---	-------------------------------------	---



# Insurance Requirement Acknowledgment

I, \_\_\_\_\_, authorized representative for \_\_\_\_\_,  
Company/Vendor

hereby acknowledge receipt of the County's required insurance limits. Said requirements:

- will be acquired within 10 working days after notification from Purchasing Department of bid awarded by the Hidalgo County Commissioners' Court;
- will acquire additional amounts required to meet the County's requirements within 10 working days after notification from Purchasing Department of bid award by the Hidalgo County Commissioners' Court; currently carry the following:

Automobile Liability: \$ \_\_\_\_\_ General Liability: \$ \_\_\_\_\_

- have already been met, see attached copy of insurance certificate.

\_\_\_\_\_  
Authorized Representative

\_\_\_\_\_  
Date

## **Notice to Bidder:**

A certificate of insurance for the required insurance limits shall be provided to the Purchasing Department's Contract Managers in order to qualify for award of bid and to execute a contract between your Company and the County

Failure to provide Certificates of Insurance to the Purchasing Department's Contract Managers will cause the bid award to be rescinded and re-awarded to next lowest bidder. Certificates of Insurance will be monitored and verified on a **quarterly basis** to ensure coverage policy is in place. It is the Company's obligation to maintain the appropriate insurance coverage throughout the term of the contract.

**THIS FORM MUST ACCOMPANY BID PACKET**



## PROJECT REQUIREMENTS ACKNOWLEDGMENT

This is to certify that I, \_\_\_\_\_, possess all of the APPLICABLE:

1. Licenses: \_\_\_\_\_.

2. Bonds: \_\_\_\_\_.

3. Certificates: \_\_\_\_\_.

4. Permits: \_\_\_\_\_.

5. Other: \_\_\_\_\_.

necessary to carry out the required project. Furthermore, I am providing copies of the required documentation so that, if my company is awarded this bid, I may be eligible to enter into a contract with Hidalgo County and proceed to complete the project in a timely manner.

\* Any licenses, bonds, certificates, permits, etc. which are required must be presented as part of the bid packet in order to expedite the bid evaluation process. Failure to provide said documentation will result in the disqualification of your bid.

\_\_\_\_\_  
Authorized Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Company

\_\_\_\_\_  
Address

\_\_\_\_\_  
City, State, Zip



# CONFLICT OF INTEREST QUESTIONNAIRE

## FORM CIQ

For vendor or other person doing business with local governmental entity

This questionnaire reflects changes made to the law by H.B. 1491, 80th Leg., Regular Session.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code by a person who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the person meets requirements under Section 176.006(a).

By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the person becomes aware of facts that require the statement to be filed. See Section 176.006, Local Government Code.

A person commits an offense if the person knowingly violates Section 176.006, Local Government Code. An offense under this section is a Class C misdemeanor.

OFFICE USE ONLY

Date Received

1 Name of person who has a business relationship with local governmental entity.

2  Check this box if you are filing an update to a previously filed questionnaire.

(The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date the originally filed questionnaire becomes incomplete or inaccurate.)

3 Name of local government officer with whom filer has employment or business relationship.

\_\_\_\_\_  
Name of Officer

This section (item 3 including subparts A, B, C & D) must be completed for each officer with whom the filer has an employment or other business relationship as defined by Section 176.001(1-a), Local Government Code. Attach additional pages to this Form CIQ as necessary.

A. Is the local government officer named in this section receiving or likely to receive taxable income, other than investment income, from the filer of the questionnaire?

Yes  No

B. Is the filer of the questionnaire receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer named in this section AND the taxable income is not received from the local governmental entity?

Yes  No

C. Is the filer of this questionnaire employed by a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership of 10 percent or more?

Yes  No

D. Describe each employment or business relationship with the local government officer named in this section.

4

\_\_\_\_\_  
Signature of person doing business with the governmental entity

\_\_\_\_\_  
Date



**PROPOSER'S AFFIDAVIT  
Exhibit "E"**

<b>PROPOSER'S AFFIDAVIT OF NON-COLLUSION NON-CONFLICT OF INTEREST, AND ANTI-LOBBYING</b>
--

STATE OF TEXAS  
COUNTY OF HIDALGO

Affiant, \_\_\_\_\_, being first duly sworn, deposes that:

(1) Affiant does hereby state neither the Proposer nor any of the Proposer's officers, partners, owners, agents, representatives, employees, or parties in interest, has in any way colluded, conspired, agreed, directly or indirectly with any person, firm, corporation, or other proposer, or potential proposer, to provide any money or other valuable consideration for assistance in procuring or attempting to procure a contract or fix the prices in the attached proposed or the proposal of any other proposer, and further states that no such money or other reward will be hereinafter paid.

(2) Affiant further states they have neither recommended or suggested to Hidalgo County or any of its officials or employees, any of the terms or provisions set forth in their Request for Proposal and subsequent agreement, except at a meeting open to all interested proposers, of which proper notice was given.

(3) Affiant, further states their officers, employees, or agents have not, and will not attempt to lobby, directly or indirectly, the Hidalgo County Commissioner's Court between proposal submission date and award by the Hidalgo County Commissioner's Court.

(4) Affiant further states no officer, or stockholder of the Proposer is a member of the staff, or related to any employee of the Hidalgo County except as noted herein below:

\_\_\_\_\_  
Signature/Title: \_\_\_\_\_

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

\_\_\_\_\_  
Notary Public

My commission expires: \_\_\_\_\_, 20\_\_\_\_



**Certification  
Regarding Debarment, Suspension Ineligibility**

As is required by the Federal Regulations Implementing Executive Order 12549, Debarment and Suspension, 45 CFR Part 76, Government-wide Debarment and Suspension, in the applicant certifies, to the best of his or her knowledge and belief, that both it and its principals:

- a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department or agency;
- b. Have not within a three-year period preceding this bid/proposal and/or application been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (federal, state or local) transaction or contract under a public transaction, violation of federal or state antitrust statutes or commission of embezzlement, theft, theory, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
- c. Are not presently indicted for or otherwise criminally or civilly charged by a government entity with commission of any of the offenses enumerated herein; and
- d. Have not within a three-year period preceding this bid/proposal and/or application had one or more public transactions terminated of cause or default.

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

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

Telephone Number: \_\_\_\_\_

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

If the proposer is unable to certify to all of the statements in this Certification, such proposer should attach an explanation to this proposal.







**HISTORICALLY UNDERUTILIZED BUSINESS (HUB) DECLARATION**

The primary objective of the Hidalgo County HUB Program is to ensure Historically Underutilized Businesses receive a fair and equal opportunity for participation in the County's procurement process. This fact holds true for Services (Professional & Non-Professional), Commodities, and Construction contracts and any subcontracts thereto. The program strongly encourages Prime Contractors to provide subcontracting opportunities to Certified Hub Contractors/Vendors. Our goal for HUB contractor/vendor participation, as well as HUB subcontractor participation is 30%. To be considered as a "Certified HUB Contractor/Vendor" the contractor/vendor must have been certified by, and hold a current and valid certification with any of the three agencies listed below.

Have you been Certified as a HUB or an MBE/WBE source?:  Yes  No

If yes, by whom?:  Texas Building & Procurement Commission  Other \_\_\_\_\_

Indicate Certification No(s): \_\_\_\_\_ or Are Certificate(s) Attached?:  Yes  No

**LIST OF CERTIFIED HUB SUBCONTRACTORS**

(Attach additional pages if necessary)

---

What percentage of the Bid, RFP, or RFQ is to be subcontracted with Certified HUB sources?: \_\_\_\_\_%  
(List HUB Subcontractor information below).

HUB Subcontractor Name: \_\_\_\_\_ HUB Status:  
Certifying Agency (Check all applicable):  Texas Building & Procurement Commission  other  
Address: \_\_\_\_\_ City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_  
Contact Person: \_\_\_\_\_ Title: \_\_\_\_\_ Phone No.: ( )  
Subcontract Amount: \$ \_\_\_\_\_ Description of Work to be Performed:

---

HUB Subcontractor Name: \_\_\_\_\_ HUB Status:  
Certifying Agency (Check all applicable):  Texas Building & Procurement Commission  other  
Address: \_\_\_\_\_ City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_  
Contact Person: \_\_\_\_\_ Title: \_\_\_\_\_ Phone No.: ( )  
Subcontract Amount: \$ \_\_\_\_\_ Description of Work to be Performed:

---

HUB Subcontractor Name: \_\_\_\_\_ HUB Status:  
Certifying Agency (Check all applicable):  Texas Building & Procurement Commission  other  
Address: \_\_\_\_\_ City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_  
Contact Person: \_\_\_\_\_ Title: \_\_\_\_\_ Phone No.: ( )  
Subcontract Amount: \$ \_\_\_\_\_ Description of Work to be Performed:

---

**(THIS PAGE MUST BE SUBMITTED WITH PROPOSAL)**



## Request for Taxpayer Identification Number and Certification

Give form to the requester. Do not send to the IRS.

Print or type  
 See Specific Instructions on page 2.

Name (as shown on your income tax return)	
Business name, if different from above	
Check appropriate box: <input type="checkbox"/> Individual/Sole proprietor <input type="checkbox"/> Corporation <input type="checkbox"/> Partnership <input type="checkbox"/> Other ▶	
<input type="checkbox"/> Exempt from backup withholding	
Address (number, street, and apt or suite no.)	Requester's name and address (optional)
City, state, and ZIP code	
List account number(s) here (optional)	

### Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on Line 1 to avoid backup withholding. For individuals, this is your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN* on page 3.

Social security number				
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25px; height: 20px; border: 1px solid black;"></td> <td style="width: 25px; height: 20px; border: 1px solid black;"></td> <td style="width: 25px; height: 20px; border: 1px solid black;"></td> <td style="width: 25px; height: 20px; border: 1px solid black;"></td> </tr> </table>				
OR				
Employer identification number				
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25px; height: 20px; border: 1px solid black;"></td> <td style="width: 25px; height: 20px; border: 1px solid black;"></td> <td style="width: 25px; height: 20px; border: 1px solid black;"></td> <td style="width: 25px; height: 20px; border: 1px solid black;"></td> </tr> </table>				

Note: If the account is in more than one name, see the chart on page 4 for guidelines on whose number to enter.

### Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding, and
3. I am a U.S. person (including a U.S. resident alien).

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the Certification, but you must provide your correct TIN. (See the instructions on page 4.)

<b>Sign Here</b>	Signature of U.S. person ▶	Date ▶
------------------	----------------------------	--------

### Purpose of Form

A person who is required to file an information return with the IRS, must obtain your correct taxpayer identification number (TIN) to report, for example, income paid to you, real estate transactions, mortgage interest you paid, acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA.

**U.S. person.** Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN to the person requesting it (the requester) and, when applicable, to:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
2. Certify that you are not subject to backup withholding, or
3. Claim exemption from backup withholding if you are a U.S. exempt payee.

**Note.** If a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

For federal tax purposes you are considered a person if you are:

- An individual who is a citizen or resident of the United States,
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States, or

- Any estate (other than a foreign estate) or trust. See Regulations sections 301.7701-8(a) and 7(a) for additional information.

**Foreign person.** If you are a foreign person, do not use Form W-9. Instead, use the appropriate Form W-8 (see Publication 515, Withholding of Tax on Nonresident Aliens and Foreign Entities).

**Nonresident alien who becomes a resident alien.**

Generally, only a nonresident alien individual may use the terms of a tax treaty to reduce or eliminate U.S. tax on certain types of income. However, most tax treaties contain a provision known as a "saving clause." Exceptions specified in the saving clause may permit an exemption from tax to continue for certain types of income even after the recipient has otherwise become a U.S. resident alien for tax purposes.

If you are a U.S. resident alien who is relying on an exception contained in the saving clause of a tax treaty to claim an exemption from U.S. tax on certain types of income, you must attach a statement to Form W-9 that specifies the following five items:

1. The treaty country. Generally, this must be the same treaty under which you claimed exemption from tax as a nonresident alien.
2. The treaty article addressing the income.
3. The article number (or location) in the tax treaty that contains the saving clause and its exceptions.



4. The type and amount of income that qualifies for the exemption from tax.

5. Sufficient facts to justify the exemption from tax under the terms of the treaty article.

**Example.** Article 20 of the U.S.-China income tax treaty allows an exemption from tax for scholarship income received by a Chinese student temporarily present in the United States. Under U.S. law, this student will become a resident alien for tax purposes if his or her stay in the United States exceeds 5 calendar years. However, paragraph 2 of the first Protocol to the U.S.-China treaty (dated April 30, 1984) allows the provisions of Article 20 to continue to apply even after the Chinese student becomes a resident alien of the United States. A Chinese student who qualifies for this exception (under paragraph 2 of the first protocol) and is relying on this exception to claim an exemption from tax on his or her scholarship or fellowship income would attach to Form W-9 a statement that includes the information described above to support that exemption.

If you are a nonresident alien or a foreign entity not subject to backup withholding, give the requester the appropriate completed Form W-8.

**What is backup withholding?** Persons making certain payments to you must under certain conditions withhold and pay to the IRS 28% of such payments (after December 31, 2002). This is called "backup withholding." Payments that may be subject to backup withholding include interest, dividends, broker and barter exchange transactions, rents, royalties, nonemployee pay, and certain payments from fishing boat operators. Real estate transactions are not subject to backup withholding.

You will not be subject to backup withholding on payments you receive if you give the requester your correct TIN, make the proper certifications, and report all your taxable interest and dividends on your tax return.

Payments you receive will be subject to backup withholding if:

1. You do not furnish your TIN to the requester, or
2. You do not certify your TIN when required (see the Part II instructions on page 4 for details), or
3. The IRS tells the requester that you furnished an incorrect TIN, or
4. The IRS tells you that you are subject to backup withholding because you did not report all your interest and dividends on your tax return (for reportable interest and dividends only), or
5. You do not certify to the requester that you are not subject to backup withholding under 4 above (for reportable interest and dividend accounts opened after 1983 only).

Certain payees and payments are exempt from backup withholding. See the instructions below and the separate instructions for the Requester of Form W-9.

## Penalties

**Failure to furnish TIN.** If you fail to furnish your correct TIN to a requester, you are subject to a penalty of \$50 for each such failure unless your failure is due to reasonable cause and not to willful neglect.

**Civil penalty for false information with respect to withholding.** If you make a false statement with no reasonable basis that results in no backup withholding, you are subject to a \$500 penalty.

**Criminal penalty for falsifying information.** Willfully falsifying certifications or affirmations may subject you to criminal penalties including fines and/or imprisonment.

**Misuse of TINs.** If the requester discloses or uses TINs in violation of federal law, the requester may be subject to civil and criminal penalties.

## Specific Instructions

### Name

If you are an individual, you must generally enter the name shown on your social security card. However, if you have changed your last name, for instance, due to marriage without informing the Social Security Administration of the name change, enter your first name, the last name shown on your social security card, and your new last name.

If the account is in joint names, list first, and then circle, the name of the person or entity whose number you entered in Part I of the form.

**Sole proprietor.** Enter your individual name as shown on your social security card on the "Name" line. You may enter your business, trade, or "doing business as (DBA)" name on the "Business name" line.

**Limited liability company (LLC).** If you are a single-member LLC (including a foreign LLC with a domestic owner) that is disregarded as an entity separate from its owner under Treasury regulations section 301.7701-3, enter the owner's name on the "Name" line. Enter the LLC's name on the "Business name" line. Check the appropriate box for your filing status (sole proprietor, corporation, etc.), then check the box for "Other" and enter "LLC" in the space provided.

**Other entities.** Enter your business name as shown on required Federal tax documents on the "Name" line. This name should match the name shown on the charter or other legal document creating the entity. You may enter any business, trade, or DBA name on the "Business name" line.

**Note.** You are requested to check the appropriate box for your status (individual/sole proprietor, corporation, etc.).

### Exempt From Backup Withholding

If you are exempt, enter your name as described above and check the appropriate box for your status, then check the "Exempt from backup withholding" box in the line following the business name, sign and date the form.

Generally, individuals (including sole proprietors) are not exempt from backup withholding. Corporations are exempt from backup withholding for certain payments, such as interest and dividends.

**Note.** If you are exempt from backup withholding, you should still complete this form to avoid possible erroneous backup withholding.

**Exempt payees.** Backup withholding is not required on any payments made to the following payees:

1. An organization exempt from tax under section 501(a), any IRA, or a custodial account under section 403(b)(7) if the account satisfies the requirements of section 401(f)(2),
2. The United States or any of its agencies or instrumentalities,
3. A state, the District of Columbia, a possession of the United States, or any of their political subdivisions or instrumentalities,
4. A foreign government or any of its political subdivisions, agencies, or instrumentalities, or
5. An international organization or any of its agencies or instrumentalities.

Other payees that may be exempt from backup withholding include:

6. A corporation,



- 7. A foreign central bank of issue,
- 8. A dealer in securities or commodities required to register in the United States, the District of Columbia, or a possession of the United States,
- 9. A futures commission merchant registered with the Commodity Futures Trading Commission,
- 10. A real estate investment trust,
- 11. An entity registered at all times during the tax year under the Investment Company Act of 1940,
- 12. A common trust fund operated by a bank under section 584(a),
- 13. A financial institution,
- 14. A middleman known in the investment community as a nominee or custodian, or
- 15. A trust exempt from tax under section 664 or described in section 4947.

The chart below shows types of payments that may be exempt from backup withholding. The chart applies to the exempt recipients listed above, 1 through 15.

IF the payment is for . . .	THEN the payment is exempt for . . .
Interest and dividend payments	All exempt recipients except for 9
Broker transactions	Exempt recipients 1 through 13. Also, a person registered under the Investment Advisers Act of 1940 who regularly acts as a broker
Barter exchange transactions and patronage dividends	Exempt recipients 1 through 5
Payments over \$600 required to be reported and direct sales over \$5,000 <sup>1</sup>	Generally, exempt recipients 1 through 7 <sup>2</sup>

<sup>1</sup>See Form 1099-MISC, Miscellaneous Income, and its instructions. However, the following payments made to a corporation (including gross proceeds paid to an attorney under section 6045(f), even if the attorney is a corporation) and reportable on Form 1099-MISC are not exempt from backup withholding: medical and health care payments, attorneys' fees, and payments for services paid by a Federal executive agency.

## Part I. Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. If you are a resident alien and you do not have and are not eligible to get an SSN, your TIN is your IRS individual taxpayer identification number (ITIN). Enter it in the social security number box. If you do not have an ITIN, see *How to get a TIN* below.

If you are a sole proprietor and you have an EIN, you may enter either your SSN or EIN. However, the IRS prefers that you use your SSN.

If you are a single-owner LLC that is disregarded as an entity separate from its owner (see *Limited liability company (LLC)* on page 2), enter your SSN (or EIN, if you have one). If the LLC is a corporation, partnership, etc., enter the entity's EIN.

Note. See the chart on page 4 for further clarification of name and TIN combinations.

**How to get a TIN.** If you do not have a TIN, apply for one immediately. To apply for an SSN, get Form SS-5, Application for a Social Security Card, from your local Social Security Administration office or get this form online at [www.socialsecurity.gov/online/ss-5.pdf](http://www.socialsecurity.gov/online/ss-5.pdf). You may also get this form by calling 1-800-772-1213. Use Form W-7, Application for IRS Individual Taxpayer Identification Number, to apply for an ITIN, or Form SS-4, Application for Employer Identification Number, to apply for an EIN. You can apply for an EIN online by accessing the IRS website at [www.irs.gov/businesses/](http://www.irs.gov/businesses/) and clicking on Employer ID Numbers under Related Topics. You can get Forms W-7 and SS-4 from the IRS by visiting [www.irs.gov](http://www.irs.gov) or by calling 1-800-TAX-FORM (1-800-829-3676).

If you are asked to complete Form W-9 but do not have a TIN, write "Applied For" in the space for the TIN, sign and date the form, and give it to the requester. For interest and dividend payments, and certain payments made with respect to readily tradable instruments, generally you will have 60 days to get a TIN and give it to the requester before you are subject to backup withholding on payments. The 60-day rule does not apply to other types of payments. You will be subject to backup withholding on all such payments until you provide your TIN to the requester.

Note. Writing "Applied For" means that you have already applied for a TIN or that you intend to apply for one soon.

Caution: A disregarded domestic entity that has a foreign owner must use the appropriate Form W-8.



## Part II. Certification

To establish to the withholding agent that you are a U.S. person, or resident alien, sign Form W-9. You may be requested to sign by the withholding agent even if items 1, 4, and 5 below indicate otherwise.

For a joint account, only the person whose TIN is shown in Part I should sign (when required). Exempt recipients, see *Exempt From Backup Withholding* on page 2.

**Signature requirements.** Complete the certification as indicated in 1 through 5 below.

**1. Interest, dividend, and barter exchange accounts opened before 1984 and broker accounts considered active during 1983.** You must give your correct TIN, but you do not have to sign the certification.

**2. Interest, dividend, broker, and barter exchange accounts opened after 1983 and broker accounts considered inactive during 1983.** You must sign the certification or backup withholding will apply. If you are subject to backup withholding and you are merely providing your correct TIN to the requester, you must cross out item 2 in the certification before signing the form.

**3. Real estate transactions.** You must sign the certification. You may cross out item 2 of the certification.

**4. Other payments.** You must give your correct TIN, but you do not have to sign the certification unless you have been notified that you have previously given an incorrect TIN. "Other payments" include payments made in the course of the requester's trade or business for rents, royalties, goods (other than bills for merchandise), medical and health care services (including payments to corporations), payments to a nonemployee for services, payments to certain fishing boat crew members and fishermen, and gross proceeds paid to attorneys (including payments to corporations).

**5. Mortgage interest paid by you, acquisition or abandonment of secured property, cancellation of debt, qualified tuition program payments (under section 529), IRA, Coverdell ESA, Archer MSA or HSA contributions or distributions, and pension distributions.** You must give your correct TIN, but you do not have to sign the certification.

## What Name and Number To Give the Requester

For this type of account:	Give name and SSN of:
1. Individual	The individual
2. Two or more individuals (joint account)	The actual owner of the account or, if combined funds, the first individual on the account <sup>1</sup>
3. Custodian account of a minor (Uniform Gift to Minors Act)	The minor <sup>2</sup>
4. a. The usual revocable savings trust (grantor is also trustee)	The grantor-trustee <sup>1</sup>
b. So-called trust account that is not a legal or valid trust under state law	The actual owner <sup>1</sup>
5. Sole proprietorship or single-owner LLC	The owner <sup>1</sup>
For this type of account:	Give name and EIN of:
6. Sole proprietorship or single-owner LLC	The owner <sup>1</sup>
7. A valid trust, estate, or pension trust	Legal entity <sup>4</sup>
8. Corporations or LLC electing corporate status on Form 8832	The corporation
9. Association, club, religious, charitable, educational, or other tax-exempt organization	The organization
10. Partnership or multi-member LLC	The partnership
11. A broker or registered nominee	The broker or nominee
12. Account with the Department of Agriculture in the name of a public entity (such as a state or local government, school district, or prison) that receives agricultural program payments	The public entity

<sup>1</sup> List first and circle the name of the person whose number you furnish. If only one person on a joint account has an SSN, that person's number must be furnished.

<sup>2</sup> Circle the minor's name and furnish the minor's SSN.

<sup>3</sup> You must show your individual name and you may also enter your business or "DBA" name on the second name line. You may use either your SSN or EIN (if you have one). If you are a sole proprietor, IRS encourages you to use your SSN.

<sup>4</sup> List first and circle the name of the legal trust, estate, or pension trust. (Do not furnish the TIN of the personal representative or trustee unless the legal entity itself is not designated in the account title.)

**Note.** If no name is circled when more than one name is listed, the number will be considered to be that of the first name listed.

## Privacy Act Notice

Section 6109 of the Internal Revenue Code requires you to provide your correct TIN to persons who must file information returns with the IRS to report interest, dividends, and certain other income paid to you, mortgage interest you paid, the acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA, or Archer MSA or HSA. The IRS uses the numbers for identification purposes and to help verify the accuracy of your tax return. The IRS may also provide this information to the Department of Justice for civil and criminal litigation, and to cities, states, and the District of Columbia to carry out their tax laws. We may also disclose this information to other countries under a tax treaty, to federal and state agencies to enforce federal nontax criminal laws, or to federal law enforcement and intelligence agencies to combat terrorism.

You must provide your TIN whether or not you are required to file a tax return. Payers must generally withhold 28% of taxable interest, dividend, and certain other payments to a payee who does not give a TIN to a payer. Certain penalties may also apply.





**HIDALGO COUNTY PRECINCT No. 4**  
**"Building Repairs/Renovations, Additions and/or Alterations to Restitution Center at 1124 "M" Road**  
**in Edinburg, TX"**

**BID No. -2013-234-08-07-MSS**

**SUBMITTAL CHECK LIST**

The following list of forms must be included in the RFB response, failure to submit any of these forms may be considered non responsive.

**Indicate with a check mark (✓) the Forms completed and included in response:**

- ..... Page 9 of Legal Notice
- ..... Exhibit "C" -Acknowledgement forms (pages 3 and 4)
- ..... Exhibit "D" -CIQ Form.
- ..... Exhibit "E" -Proposers Affidavit
- ..... Certification Regarding Debarment
- ..... Vendor Bidder Application and IRS form W-9
- ..... STATEMENT OF CREDENTIALS

..... One (1) original and three (3) copies of complete Response, including any other documentation requested in this RFB not herein listed (i.e. Bid Form, Bid Bond, Sub-Contractors List, references, etc).

Name: \_\_\_\_\_

Signature: \_\_\_\_\_

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



## SECTION 01100

### SUMMARY

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Contract description.
- B. Contractor's use of site and premises.
- C. Specification Conventions.

##### 1.2 CONTRACT DESCRIPTION

- A. Work of the Project includes renovations of existing facility for the Restitution Building located at 1124 "M" Road, Edinburg, Texas.
- B. Perform Work of Contract under fixed cost contract with Owner in accordance with Conditions of Contract.
- C. Work under this contract includes:
  - 1. Base bid includes the renovation of existing facilities. Alternate bids are included for Complete Building Power Generator, Base Electrical Package, and Kitchen Appliances.

##### 1.3 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Limit use of site and premises to allow:
  - 1. The owner will continue to use the existing premises for daily operation while the new area is constructed as long as is possible for construction. The Contractor shall coordinate with the owner for work schedules. The Contractor shall notify the Owner within a minimum of 14 days in advance when use of the existing facility must be terminated for demolition and remodeling of the facility.

##### 1.4 FUTURE WORK – Not Used

##### 1.5 SPECIFICATION CONVENTIONS

- A. These specifications are written in imperative mood and streamlined form. This imperative language is directed to the Contractor, unless specifically noted otherwise. The words "shall be" are included by inference where a colon (:) is used within sentences or phrases.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

## SECTION 01200

### PRICE AND PAYMENT PROCEDURES

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Schedule of values.
- B. Applications for payment.
- C. Change procedures.
- D. Defect assessment.
- E. Alternates.

##### 1.2 SCHEDULE OF VALUES

- A. Submit printed schedule on Contractor's standard form or electronic media printout will be considered.
- B. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- C. Format: Utilize Table of Contents of this Project Manual. Identify each line item with number and title of major specification Section. Identify site mobilization, bonds and insurance.
- D. Include in each line item, amount of Allowances specified in this section.
- E. Include within each line item, direct proportional amount of Contractor's overhead and profit.
- F. Revise schedule to list approved Change Orders, with each Application For Payment.

##### 1.3 APPLICATIONS FOR PAYMENT

- A. Submit three copies of each application on Owner designated form.
- B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
- C. Submit updated construction schedule with each Application for Payment.
- D. Payment Period: Submit at intervals stipulated in the Agreement.
- E. Submit with transmittal letter as specified for Submittals in Section 01330 - Submittal Procedures.
- F. Submit waivers.

- G. Substantiating Data: When Architect/Engineer requires substantiating information, submit data justifying dollar amounts in question. Include the following with Application for Payment:
  - 1. Current construction photographs specified in Section.
  - 2. Partial release of liens from major subcontractors and vendors.
  - 3. Record documents as specified in Section, for review by Owner which will be returned to Contractor.
  - 4. Affidavits attesting to off-site stored products.
  - 5. Construction progress schedules, revised and current as specified in Section.

#### 1.4 CHANGE PROCEDURES

- A. Submittals: Submit name of individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. The Architect/Engineer will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions.
- C. The Architect/Engineer may issue a Proposal Request including a detailed description of proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change with stipulation of overtime work required and the period of time during which the requested price will be considered valid. Contractor will prepare and submit estimate within 5 days.
- D. Contractor may propose changes by submitting a request for change to Architect/Engineer, describing proposed change and its full effect on the Work. Include a statement describing reason for the change, and effect on Contract Sum/Price and Contract Time with full documentation and a statement describing effect on Work by separate or other Contractors. Document requested substitutions in accordance with Section 01600 - Product Requirements.
- E. Stipulated Sum/Price Change Order: Based on Proposal Requestor Notice of Change and Contractor's price quotation or Contractor's request for Change Order as approved by Architect/Engineer.
- F. Construction Change Directive: Architect/Engineer may issue directive, signed by Owner, instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute change.
- G. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in Conditions of the Contract. Architect/Engineer will determine change allowable in Contract Sum/Price and Contract Time as provided in Contract Documents.
- H. Maintain detailed records of work done on Time and Material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.
- I. Document each quotation for change in cost or time with sufficient data to allow evaluation of quotation.

- J. Change Order Forms: AIA G701
- K. Execution of Change Orders: Architect/Engineer will issue Change Orders for signatures of parties as provided in Conditions of the Contract.
- L. Correlation Of Contractor Submittals:
  - 1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum/Price.
  - 2. Promptly revise progress schedules to reflect change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
  - 3. Promptly enter changes in Project Record Documents.

#### 1.5 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of the Architect/Engineer, it is not practical to remove and replace the Work, the Architect/Engineer will direct appropriate remedy or adjust payment.
- C. The defective Work may remain, but price will be adjusted to new price reduced at discretion of Architect/Engineer.
- D. Defective Work will be partially repaired to instructions of Architect/Engineer, and price will be reduced at discretion of Architect/Engineer.
- E. Individual specification sections may modify these options or may identify specific formula or percentage sum/price reduction.
- F. Authority of Architect/Engineer to assess defects and identify payment adjustments is final.
- G. Non-Payment For Rejected Products: Payment will not be made for rejected products for any of the following:
  - 1. Products wasted or disposed of in a manner that is not acceptable.
  - 2. Products determined as unacceptable before or after placement.
  - 3. Products not completely unloaded from transporting vehicle.
  - 4. Products placed beyond lines and levels of required Work.
  - 5. Products remaining on hand after completion of the Work.
  - 6. Loading, hauling, and disposing of rejected products.

#### 1.6 ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work.
- C. Schedule of Alternates – Not Used

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01300  
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Coordination and project conditions.
- B. Field engineering.
- C. Preconstruction meeting.
- D. Progress meetings.
- E. Cutting and patching.
- F. Special procedures.

1.2 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of various sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, operating equipment.
- C. Coordinate space requirements, supports, and installation of mechanical and electrical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.
- E. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owner's partial occupancy.
- F. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.3 FIELD ENGINEERING

- A. Employ Land Surveyor registered in State of Texas and acceptable to Architect/Engineer.
- B. Locate and protect survey control and reference points. Promptly notify Architect/Engineer of discrepancies discovered.

- C. Control datum for survey is that established by Owner provided survey and shown on Drawings.
- D. Verify set-backs and easements; confirm drawing dimensions and elevations.
- E. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.
- F. On completion of work, submit as-built drawings illustrating dimensions, locations, angles, and elevations of construction and site work.
- G. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- H. Promptly report to Architect/Engineer loss or destruction of reference point or relocation required because of changes in grades or other reasons.
- I. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect/Engineer.

#### 1.4 PRECONSTRUCTION MEETING

- A. Architect will schedule meeting after Notice of Award.
- B. Attendance Required: Owner, Architect/Engineer, and Contractor.
- C. Agenda:
  1. Execution of Owner-Contractor Agreement.
  2. Submission of executed bonds and insurance certificates.
  3. Distribution of Contract Documents.
  4. Submission of list of Subcontractors, list of products, schedule of values, and progress schedule.
  5. Designation of personnel representing parties in Contract, and Architect/Engineer.
  6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
  7. Scheduling.
  8. Scheduling activities of Geotechnical Engineer.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect/Engineer, Owner, and those affected by decisions made.

#### 1.5 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: Job superintendent, major subcontractors and suppliers, Owner, Architect/Engineer, as appropriate to agenda topics for each meeting.
- D. Agenda:
  1. Review minutes of previous meetings.

2. Review of Work progress.
  3. Field observations, problems, and decisions.
  4. Identification of problems impeding planned progress.
  5. Review of submittals schedule and status of submittals.
  6. Review of off-site fabrication and delivery schedules.
  7. Maintenance of progress schedule.
  8. Corrective measures to regain projected schedules.
  9. Planned progress during succeeding work period.
  10. Coordination of projected progress.
  11. Maintenance of quality and work standards.
  12. Effect of proposed changes on progress schedule and coordination.
  13. Other business relating to Work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect/Engineer, Owner, and those affected by decisions made.

## PART 2 PRODUCTS - Not Used

## PART 3 EXECUTION

### 3.1 CUTTING AND PATCHING

- A. Employ skilled and experienced installer to perform cutting and patching.
- B. Submit written request in advance of cutting or altering elements affecting:
  1. Structural integrity of element.
  2. Integrity of weather-exposed or moisture-resistant elements.
  3. Efficiency, maintenance, or safety of element.
  4. Visual qualities of sight exposed elements.
  5. Work of Owner or separate contractor.
- C. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:
  1. Fit the several parts together, to integrate with other Work.
  2. Uncover Work to install or correct ill-timed Work.
  3. Remove and replace defective and non-conforming Work.
  4. Remove samples of installed Work for testing.
  5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.
- D. Execute work by methods to avoid damage to other Work, and to provide proper surfaces to receive patching and finishing.
- E. Cut masonry and concrete materials using masonry saw or core drill.
- F. Restore Work with new products in accordance with requirements of Contract Documents.
- G. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.
- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with material in accordance with Section 07840, to full thickness of penetrated element.

- J. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.
- K. Identify hazardous substances or conditions exposed during the Work to Architect/Engineer for decision or remedy.

### 3.2 SPECIAL PROCEDURES

- A. Materials: As specified in product sections; match existing with new products and salvaged products for patching and extending work.
- B. Employ skilled and experienced installer to perform alteration work.
- C. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.
- D. Remove unsuitable material not marked for salvage, including rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.
- E. Remove debris and abandoned items from area and from concealed spaces.
- F. Prepare surface and remove surface finishes to permit installation of new work and finishes.
- G. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.
- H. Remove, cut, and patch Work in manner to minimize damage and to permit restoring products and finishes to original or specified condition.
- I. Refinish existing visible surfaces to remain in renovated rooms and spaces, to specified renewed condition for each material, with neat transition to adjacent finishes.
- J. Where new Work abuts or aligns with existing, provide smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.
- K. When finished surfaces are cut so that smooth transition with new Work is not possible, terminate existing surface along straight line at natural line of division and submit recommendation to Architect/Engineer for review.
- L. Where change of plane of 1/4 inch or more occurs, submit recommendation for providing smooth transition; to Architect/Engineer for review. request instructions from Architect/Engineer.
- M. Trim existing doors to clear new floor finish. Refinish trim to original or specified condition.
- N. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.
- O. Finish surfaces as specified in individual product sections.

END OF SECTION

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SECTION 01330  
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submittal procedures.
- B. Construction progress schedules.
- C. Proposed products list.
- D. Product data.
- E. Shop drawings.
- F. Samples.
- G. Design data.
- H. Test reports.
- I. Certificates.
- J. Manufacturer's instructions.
- K. Manufacturer's field reports.
- L. Erection drawings.
- M. Construction photographs.

1.2 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Architect/Engineer accepted form.
- B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.
- C. Identify Project, Contractor, subcontractor and supplier; pertinent drawing and detail number, and specification section number, appropriate to submittal.
- D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite Project, and deliver to Architect/Engineer at business address. Coordinate submission of related items.

- F. For each submittal for review, allow 15 days excluding delivery time to and from Contractor.
- G. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of completed Work.
- H. Allow space on submittals for Contractor and Architect/Engineer review stamps.
- I. When revised for resubmission, identify changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.
- K. Submittals not requested will not be recognized or processed.

### 1.3 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial schedules within 15 days after date of Owner-Contractor Agreement. After review, resubmit required revised data within ten days.
- B. Submit revised Progress Schedules with each Application for Payment.
- C. Distribute copies of reviewed schedules to Project site file, subcontractors, suppliers, and other concerned parties.
- D. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.
- E. Submit computer generated horizontal bar chart with separate line for each major portion of Work or operation section of Work, identifying first work day of each week.
- F. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate early and late start, early and late finish, float dates, and duration.
- G. Indicate estimated percentage of completion for each item of Work at each submission.
- H. Submit separate schedule of submittal dates for shop drawings, product data, and samples, including Owner furnished products and products identified under Allowances, and dates reviewed submittals will be required from Architect/Engineer. Indicate decision dates for selection of finishes.
- I. Indicate delivery dates for Owner furnished products and products identified under Allowances.
- J. Revisions To Schedules:
  1. Indicate progress of each activity to date of submittal, and projected completion date of each activity.
  2. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
  3. Prepare narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect including effect of changes on schedules of separate contractors.

#### 1.4 PROPOSED PRODUCTS LIST

- A. Within 15 days after date of Owner-Contractor Agreement, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

#### 1.5 PRODUCT DATA

- A. Product Data: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Submit number of copies Contractor requires, plus two copies Architect/Engineer will retain.
- C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- E. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01700 - Execution Requirements.

#### 1.6 SHOP DRAWINGS

- A. Shop Drawings: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. When required by individual specification sections, provide shop drawings signed and sealed by professional engineer responsible for designing components shown on shop drawings.
  - 1. Include signed and sealed calculations to support design.
  - 2. Submit drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
  - 3. Make revisions and provide additional information when required by authorities having jurisdiction.
- D. Submit number of opaque reproductions Contractor requires, plus three copies Architect/Engineer will retain.
- E. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01700 - Execution Requirements.

#### 1.7 SAMPLES

- A. Samples: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Samples For Selection as Specified in Product Sections:
  - 1. Submit to Architect/Engineer for aesthetic, color, or finish selection.

- 2. Submit samples of finishes from full range of manufacturers' standard colors, in custom colors selected, textures, and patterns for Architect/Engineer selection.
  - C. Submit samples to illustrate functional and aesthetic characteristics of Products, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
  - D. Include identification on each sample, with full Project information.
  - E. Submit number of samples specified in individual specification sections; Architect/Engineer will retain one sample.
  - F. Reviewed samples which may be used in the Work are indicated in individual specification sections.
  - G. Samples will not be used for testing purposes unless specifically stated in specification section.
  - H. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents purposes described in Section 01700 - Execution Requirements.
- 1.8 DESIGN DATA
- A. Submit for Architect/Engineer's knowledge as contract administrator or for Owner.
  - B. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.
- 1.9 TEST REPORTS
- A. Submit for Architect/Engineer's knowledge as contract administrator or for Owner.
  - B. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.
- 1.10 CERTIFICATES
- A. When specified in individual specification sections, submit certification by manufacturer, installation/application subcontractor, or Contractor to Architect/Engineer, in quantities specified for Product Data.
  - B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
  - C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect/Engineer.
- 1.11 MANUFACTURER'S INSTRUCTIONS
- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Architect/Engineer for delivery to Owner in quantities specified for Product Data.
  - B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

#### 1.12 MANUFACTURER'S FIELD REPORTS

- A. Submit reports for Architect/Engineer's benefit as contract administrator or for Owner.
- B. Submit report in duplicate within 5 days 24 hours of observation to Architect/Engineer for information.
- C. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

#### 1.13 ERECTION DRAWINGS

- A. Submit drawings for Architect/Engineer's benefit as contract administrator or for Owner.
- B. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.
- C. Data indicating inappropriate or unacceptable Work may be subject to action by Architect/Engineer or Owner.

#### 1.14 CONSTRUCTION PHOTOGRAPHS

- A. Provide photographs of site and construction throughout progress of Work produced by an experienced photographer, acceptable to Architect/Engineer.
- B. Each month submit photographs with Application for Payment.
- C. Photographs: mounted on 8-1/2 x 11 inch soft card stock, with left edge binding margin for three hole punch.
- D. Take two site photographs from differing directions and five interior photographs indicating relative progress of the Work, five days maximum prior to submitting.
- E. Identify each print. Identify name of Project, contract number phase orientation of view, date and time of view, and photographer's numbered identification of exposure.
- F. Deliver negatives or electronic files to Owner with project record documents. Catalog and index negatives in chronological sequence; include typed table of contents.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

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SECTION 01400  
QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Quality control and control of installation.
- B. Tolerances.
- C. References.
- D. Labeling.
- E. Mock-up requirements.
- F. Testing and inspection services.
- G. Manufacturers' field services.
- H. Examination.
- I. Preparation.

1.2 QUALITY CONTROL AND CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. When manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.3 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

- B. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

#### 1.4 REFERENCES

- A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Owner-Contractor Agreement when there are no Bids, except where specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. When specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- E. Neither contractual relationships, duties, nor responsibilities of parties in Contract nor those of Architect/Engineer shall be altered from Contract Documents by mention or inference otherwise in reference documents.

#### 1.5 LABELING

- A. Attach label from agency approved by authority having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.
- B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label.
  - 1. Model number.
  - 2. Serial number.
  - 3. Performance characteristics.

#### 1.6 MOCK-UP REQUIREMENTS

- A. Tests will be performed under provisions identified in this section and identified in respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mock-ups shall be comparison standard for remaining Work.
- D. Where mock-up has been accepted by Architect/Engineer and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so by Architect/Engineer.

#### 1.7 TESTING AND INSPECTION SERVICES

- A. Owner will employ and pay for specified services of an independent firm to perform testing and inspection.

- B. Testing, inspections and source quality control may occur on or off project site. Perform off-site testing as required by Architect/Engineer or Owner.
- C. Reports will be submitted by independent firm to Architect/Engineer, Contractor, and authority having jurisdiction, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
  - 1. Submit final report indicating correction of Work previously reported as non-compliant.
- D. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
  - 1. Notify Architect/Engineer and independent firm 24 hours prior to expected time for operations requiring services.
  - 2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
- E. Testing and employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- F. Re-testing or re-inspection required because of non-conformance to specified requirements shall be performed by same independent firm on instructions by Architect/Engineer. Payment for re-testing or re-inspection will be charged to Contractor by deducting testing charges from Contract Sum/Price.
- G. Agency Responsibilities:
  - 1. Test samples of mixes submitted by Contractor.
  - 2. Provide qualified personnel at site. Cooperate with Architect/Engineer and Contractor in performance of services.
  - 3. Perform specified sampling and testing of products in accordance with specified standards.
  - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
  - 5. Promptly notify Architect/Engineer and Contractor of observed irregularities or non-conformance of Work or products.
  - 6. Perform additional tests required by Architect/Engineer.
  - 7. Attend preconstruction meetings and progress meetings.
- H. Agency Reports: After each test, promptly submit two copies of report to Architect/Engineer, Contractor, and authority having jurisdiction. When requested by Architect/Engineer, provide interpretation of test results. Include the following:
  - 1. Date issued.
  - 2. Project title and number.
  - 3. Name of inspector.
  - 4. Date and time of sampling or inspection.
  - 5. Identification of product and specifications section.
  - 6. Location in Project.
  - 7. Type of inspection or test.
  - 8. Date of test.
  - 9. Results of tests.
  - 10. Conformance with Contract Documents.
- I. Limits On Testing Authority:
  - 1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
  - 2. Agency or laboratory may not approve or accept any portion of the Work.
  - 3. Agency or laboratory may not assume duties of Contractor.

4. Agency or laboratory has no authority to stop the Work.

#### 1.8 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Architect/Engineer 30 days in advance of required observations. Observer subject to approval of Architect/Engineer.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- D. Refer to Section 01330 - Submittal Procedures, MANUFACTURERS' FIELD REPORTS article.

#### PART 2 PRODUCTS - Not Used

#### PART 3 EXECUTION

##### 3.1 EXAMINATION

- A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Verify utility services are available, of correct characteristics, and in correct locations.

##### 3.2 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

END OF SECTION

## SECTION 01500

### TEMPORARY FACILITIES AND CONTROLS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Temporary Utilities:
  - 1. Temporary electricity.
  - 2. Temporary lighting for construction purposes.
  - 3. Temporary water service.
  - 4. Temporary sanitary facilities.
  
- B. Construction Facilities:
  - 1. Field offices and sheds.
  - 2. Vehicular access.
  - 3. Parking.
  - 4. Progress cleaning and waste removal.
  - 5. Project identification.
  - 6. Traffic regulation.
  - 7. Fire prevention facilities.
  
- C. Temporary Controls:
  - 1. Barriers.
  - 2. Enclosures and fencing.
  - 3. Security.
  - 4. Water control.
  - 5. Dust control.
  - 6. Erosion and sediment control.
  - 7. Noise control.
  - 8. Pest control.
  - 9. Pollution control.
  - 10. Rodent control.
  
- D. Removal of utilities, facilities, and controls.

##### 1.2 TEMPORARY ELECTRICITY

- A. Provide and pay for power service required from utility source as needed for construction operation. Utilize Owner's existing power service, provide separate metering and reimburse Owner for cost of energy used.
  
- B. Do not disrupt Owner's use of service.
  
- C. Complement existing power service capacity and characteristics as required for construction operations.
  
- D. Provide power outlets, with branch wiring and distribution boxes located at each floor as required for construction operations. Provide flexible power cords as required for portable construction tools and equipment.

- E. Provide main service disconnect and over-current protection at convenient location feeder switch at source distribution equipment.
- F. Permanent convenience receptacles may not be utilized during construction.
- G. Provide distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.
  1. Provide 20 ampere duplex outlets, single phase circuits for power tools for active work area.
  2. Provide 20 ampere, single phase branch circuits for lighting.

### 1.3 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain incandescent lighting for construction operations to achieve minimum lighting level of 2 watt/sq ft.
- B. Provide and maintain 1 watt/sq ft lighting to exterior staging and storage areas entire site after dark for security purposes.
- C. Provide and maintain 0.25 watt/sq ft HID lighting to interior work areas after dark for security purposes.
- D. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps for specified lighting levels.
- E. Maintain lighting and provide routine repairs.
- F. Permanent building lighting may be utilized during construction.

### 1.4 TEMPORARY WATER SERVICE

- A. Provide and pay for suitable quality water service as needed to maintain specified conditions for construction operations.

### 1.5 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide facilities at time of project mobilization.

### 1.6 FIELD OFFICES AND SHEDS

- A. Do not use existing facilities for field offices or for storage.
- B. Do not use permanent facilities for field offices or for storage.
- C. Construction: Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations with steps and landings at entrance doors.
  1. Construction: Structurally sound, secure, weather tight enclosures for office and storage spaces. Maintain during progress of Work; remove when no longer needed at completion of Work.
- D. Storage Areas And Sheds: Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and for inspection of products to requirements of Section 01600 - Product Requirements.

- E. Preparation: Fill and grade sites for temporary structures sloped for drainage away from buildings.
- F. Installation:
  - 1. Employee Residential Occupancy: Not allowed on Owner's property.
- G. Maintenance And Cleaning:
  - 1. Minimum Weekly janitorial services for offices; periodic cleaning and maintenance for office and storage areas.
  - 2. Maintain approach walks free of mud, water, and snow.
- H. Removal: At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

#### 1.7 VEHICULAR ACCESS

- A. Construct temporary all-weather access roads from public thoroughfares to serve construction area, of width and load bearing capacity to accommodate unimpeded traffic for construction purposes.
- B. Extend and relocate vehicular access as Work progress requires, provide detours as necessary for unimpeded traffic flow.
- C. Location as approved by Architect/Engineer.
- D. Provide unimpeded access for emergency vehicles. Maintain 20 feet wide driveways with turning space between and around combustible materials.
- E. Provide and maintain access to fire hydrants and control valves free of obstructions.
- F. Provide means of removing mud from vehicle wheels before entering streets.

#### 1.8 PARKING

- A. Coordinate with Architect for temporary parking areas to accommodate construction personnel.
- B. Locate as approved by Architect/Engineer.
- C. When site space is not adequate, provide additional off-site parking.
- D. Use of designated existing on-site streets and driveways used for construction traffic is not permitted. Tracked vehicles not allowed on paved areas.
- E. Do not allow heavy vehicles or construction equipment in parking areas.
- F. Permanent Pavements And Parking Facilities:
  - 1. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.
  - 2. Use of permanent parking structures is permitted.
- G. Maintenance:
  - 1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, and ice.

2. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.
- H. Removal, Repair:
1. Remove temporary materials and construction when permanent paving is usable at Substantial Completion.
  2. Remove underground work and compacted materials to depth of 2 feet; fill and grade site as specified.
  3. Repair existing permanent facilities damaged by use, to original specified condition.
- I. Mud From Site Vehicles: Provide means of removing mud from vehicle wheels before entering streets.

#### 1.9 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing spaces.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and rubbish from site periodically weekly and dispose off-site.
- E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

#### 1.10 PROJECT IDENTIFICATION

- A. Project Identification Sign:
  1. One painted sign, 32 sq ft area, bottom 6 feet above ground.
  2. Content:
    - a. Project number, title, logo and name of Owner as indicated on Contract Documents.
    - b. Names and titles of authorities.
    - c. Names and titles of Architect/Engineer and Consultants.
    - d. Name of Prime Contractor and major Subcontractors.
  3. Graphic Design, Colors, Style of Lettering: Designated by Architect/Engineer.
- B. Project Informational Signs:
  1. Painted informational signs of same colors and lettering as Project Identification sign, or standard products; size lettering for legibility at 100 feet distance.
  2. Provide sign at each field office, storage shed, and directional signs to direct traffic into and within site. Relocate as Work progress requires.
  3. No other signs are allowed without Owner permission except those required by law.
- C. Design sign and structure to withstand 60 miles/hr wind velocity.
- D. Sign Painter: Experienced as professional sign painter for minimum three years.

- E. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.
- F. Show content, layout, lettering, color, foundation, structure, sizes, and grades of members.
- G. Sign Materials:
  - 1. Structure and Framing: Structurally adequate and approved by Architect.
  - 2. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inches thick, standard large sizes to minimize joints.
  - 3. Rough Hardware: Galvanized.
  - 4. Paint and Primers: Exterior quality, two coats; sign background of color as selected.
  - 5. Lettering: Exterior quality paint, contrasting colors as selected.
- H. Installation:
  - 1. Install project identification sign within 15 days after date fixed by Notice to Proceed.
  - 2. Erect at designated location.
  - 3. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
  - 4. Install sign surface plumb and level, with butt joints. Anchor securely.
  - 5. Paint exposed surfaces of sign, supports, and framing.
- I. Maintenance: Maintain signs and supports clean, repair deterioration and damage.
- J. Removal: Remove signs, framing, supports, and foundations at completion of Project and restore area.

#### 1.11 FIRE PREVENTION FACILITIES

- A. Prohibit smoking with buildings under construction and demolition. Designate area on site where smoking is permitted. Provide approved ashtrays in designated smoking areas.
- B. Establish fire watch for cutting and welding and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.

#### 1.12 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide protection for plants designated to remain. Replace damaged plants.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

#### 1.13 ENCLOSURES AND FENCING

- A. Construction: Contractor's option Commercial grade chain link fence or Plastic construction netting.
- B. Provide 6 feet high fence around construction site; equip with vehicular and pedestrian gates with locks.
- C. Exterior Enclosures:

1. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.
2. Provide temporary roofing as specified in Section.

#### 1.14 SECURITY

- A. Security Program:
  1. Protect Work existing premises from theft, vandalism, and unauthorized entry.
  2. Maintain program throughout construction period until Owner occupancy Owner acceptance precludes need for Contractor security directed by Architect/Engineer.
- B. Entry Control:
  1. Restrict entrance of persons and vehicles into Project site and existing facilities.
  2. Allow entrance only to authorized persons with proper identification.
  3. Coordinate access of Owner's personnel to site in coordination with Owner's designated personnel.
- C. Restrictions:
  1. Do not allow cameras on site or photographs taken except by written approval of Owner.
  2. Do no work on days indicated in Owner-Contractor Agreement.

#### 1.15 WATER CONTROL

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment as required.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

#### 1.16 DUST CONTROL

- A. Execute Work by methods to minimize raising dust from construction operations.
- B. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

#### 1.17 EROSION AND SEDIMENT CONTROL

- A. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- B. Minimize surface area of bare soil exposed at one time.
- C. Provide temporary measures including berms, dikes, and drains, and other devices to prevent water flow.
- D. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
- E. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

1.18 NOISE CONTROL

- A. Provide methods, means, and facilities to minimize noise from and noise produced by construction operations.

1.19 PEST CONTROL

- A. Provide methods, means, and facilities to prevent pests and insects from damaging the Work.

1.20 POLLUTION CONTROL

- A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.
- B. Comply with pollution and environmental control requirements of authorities having jurisdiction.

1.21 RODENT CONTROL

- A. Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

1.22 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion Final Application for Payment inspection.
- B. Remove underground installations to minimum depth of 2 feet. Grade site as indicated on Drawings.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

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SECTION 01600  
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Products.
- B. Product delivery requirements.
- C. Product storage and handling requirements.
- D. Product options.
- E. Product substitution procedures.
- F. Equipment electrical characteristics and components.

1.2 PRODUCTS

- A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.
- C. Furnish interchangeable components from same manufacturer for components being replaced.

1.3 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products in accordance with manufacturers' instructions.
- B. Store with seals and labels intact and legible.
- C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- D. For exterior storage of fabricated products, place on sloped supports above ground.

- E. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.
- H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

#### 1.5 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit request for substitution for any manufacturer not named in accordance with the following article.

#### 1.6 PRODUCT SUBSTITUTION PROCEDURES

- A. Architect/Engineer will consider requests for Substitutions only within 30 days after date of Owner-Contractor Agreement. Substitutions will not may be considered when a product becomes unavailable through no fault of Contractor.
- B. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- C. A request constitutes a representation that Bidder/Contractor:
  1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
  2. Will provide same warranty for Substitution as for specified product.
  3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
  4. Waives claims for additional costs or time extension which may subsequently become apparent.
  5. Will reimburse Owner and Architect/Engineer for review or redesign services associated with re-approval by authorities having jurisdiction.
- D. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.
- E. Substitution Submittal Procedure:

1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
2. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
3. Architect/Engineer will notify Contractor in writing of decision to accept or reject request.

## PART 2 PRODUCTS

### 2.1 EQUIPMENT ELECTRICAL CHARACTERISTICS AND COMPONENTS

- A. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Include lugs for terminal box.
- B. Cord and Plug: Furnish minimum 6 foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

## PART 3 EXECUTION - Not Used

END OF SECTION

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SECTION 01700  
EXECUTION REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Closeout procedures.
- B. Final cleaning.
- C. Starting of systems.
- D. Demonstration and instructions.
- E. Testing, adjusting and balancing.
- F. Protecting installed construction.
- G. Project record documents.
- H. Operation and maintenance data.
- I. Manual for materials and finishes.
- J. Manual for equipment and systems.
- K. Spare parts and maintenance products.
- L. Product warranties and product bonds.
- M. Maintenance service.

1.2 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect/Engineer's review.
- B. Provide submittals to Architect/Engineer required by authorities having jurisdiction.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.3 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.

- B. Clean equipment and fixtures to sanitary condition with cleaning materials appropriate to surface and material being cleaned.
- C. Clean debris from roofs, gutters, downspouts, and drainage systems.
- D. Clean site; sweep paved areas, rake clean landscaped surfaces.
- E. Remove waste and surplus materials, rubbish, and construction facilities from site.

#### 1.4 STARTING OF SYSTEMS

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect/Engineer seven days prior to start-up of each item.
- C. Verify each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.
- E. Verify wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractors' personnel in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report in accordance with Section 01330 - Submittal Procedures that equipment or system has been properly installed and is functioning correctly.

#### 1.5 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of final inspection.
- B. Demonstrate Project equipment and instructed by qualified representative who is knowledgeable about the Project.
- C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

- E. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.
- F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- G. Required instruction time for each item of equipment and system is specified in individual sections.

#### 1.6 PROTECTING INSTALLED CONSTRUCTION

- A. Protect installed Work and provide special protection where specified in individual specification sections.
- B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- F. Prohibit traffic from landscaped areas.

#### 1.7 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
  - 1. Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other modifications to the Contract.
  - 5. Reviewed Shop Drawings, Product Data, and Samples.
  - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
  - 1. Manufacturer's name and product model and number.

2. Product substitutions or alternates utilized.
  3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
1. Measured depths of foundations in relation to finish first main floor datum.
  2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
  4. Field changes of dimension and detail.
  5. Details not on original Contract drawings.
- G. Submit documents to Architect/Engineer with claim for final Application for Payment.
- 1.8 OPERATION AND MAINTENANCE DATA
- A. Submit data bound in 8-1/2 x 11 inch (A4) text pages, three D side ring capacity expansion binders with durable plastic cloth covers.
- B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.
- C. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- D. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- E. Contents: Prepare Table of Contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.
  2. Part 2: Operation and maintenance instructions, arranged by system process flow and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
    - a. Significant design criteria.
    - b. List of equipment.
    - c. Parts list for each component.
    - d. Operating instructions.
    - e. Maintenance instructions for equipment and systems.
    - f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
  3. Part 3: Project documents and certificates, including the following:
    - a. Shop drawings and product data.
    - b. Air and water balance reports.
    - c. Certificates.

- d. Originals Photocopies of warranties and bonds.

#### 1.9 MANUAL FOR MATERIALS AND FINISHES

- A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect/Engineer will review draft and return one copy with comments.
- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- C. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy be reviewed and returned after final inspection, with Architect/Engineer comments. Revise content of document sets as required prior to final submission.
- D. Submit two sets of revised final volumes in final form within 10 days after final inspection.
- E. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Include information for re-ordering custom manufactured products.
- F. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- G. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Include recommendations for inspections, maintenance, and repair.
- H. Additional Requirements: As specified in individual product specification sections.
- I. Include listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

#### 1.10 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect/Engineer will review draft and return one copy with comments.
- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- C. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy be reviewed and returned after final inspection, with Architect/Engineer comments. Revise content of document sets as required prior to final submission.

- D. Submit two sets of revised final volumes in final form within 10 days after final inspection.
- E. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.
- F. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed. by label machine.
- G. Include color coded wiring diagrams as installed.
- H. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and special operating instructions.
- I. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- J. Include servicing and lubrication schedule, and list of lubricants required.
- K. Include manufacturer's printed operation and maintenance instructions.
- L. Include sequence of operation by controls manufacturer.
- M. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- N. Include control diagrams by controls manufacturer as installed.
- O. Include Contractor's coordination drawings, with color coded piping diagrams as installed.
- P. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- Q. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- R. Include test and balancing reports as specified in Section 01400 - Quality Requirements.
- S. Additional Requirements: As specified in individual product specification sections.
- T. Include listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

### 1.11 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Furnish spare parts, maintenance, and extra products in quantities specified in individual specification sections.
- B. Deliver to Project site and place in location as directed by Owner; obtain receipt prior to final payment.

### 1.12 PRODUCT WARRANTIES AND PRODUCT BONDS

- A. Obtain warranties and bonds executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
- B. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers.
- C. Verify documents are in proper form, contain full information, and are notarized.
- D. Co-execute submittals when required.
- E. Include Table of Contents and assemble in three D side ring binder with durable plastic cloth cover.
- F. Submit prior to final Application for Payment.
- G. Time Of Submittals:
  - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
  - 2. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.
  - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty or bond period.

### 1.13 MAINTENANCE SERVICE

- A. Furnish service and maintenance of components indicated in specification sections for year from date of Substantial Completion.
- B. Examine system components at frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by manufacturer of original component.
- D. Do not assign or transfer maintenance service to agent or Subcontractor without prior written consent of Owner.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

## SECTION 06114

### MISCELLANEOUS ROUGH CARPENTRY

#### PART 1 GENERAL

##### 1.1. SECTION INCLUDES

- 1.1.1. Wood nailers to be built into the roof edges, concealed wood blocking in partitions, and plywood decking above certain metal-framed ceilings.
- 1.1.2. Fire retardant treatment of wood nailers, blocking and plywood.

##### 1.2. RELATED SECTIONS

- 1.2.1. Section 07535 –Elastomeric Roofing - Mechanically Attached: Membrane roofing system to be installed over wood nailers.
- 1.2.2. Section 07620 – Sheet Metal Work, Gutters and Downspouts: Metal fascia cladding and gutters to be attached to wood nailers.

##### 1.3. SUBMITTALS FOR REVIEW

- 1.3.1. Division 1 - General Requirements: Procedures for submittals.
- 1.3.2. Product Data: Provide technical data on wood preservative materials.

##### 1.4. QUALITY ASSURANCE

- 1.4.1. Perform Work in accordance with the following agencies:
  - 1) Lumber Grading Agency: Certified by ALSC.

#### PART 2 PRODUCTS

##### 2.1. MATERIALS

- 2.1.1. Lumber Grading Rules: SPIB.
- 2.1.2. Nailers and Blocking: Southern Pine; Minimum No. 2 grade; free from warping and visible decay, 19 percent maximum moisture content.

##### 2.2. PLYWOOD

- 2.2.1. Plywood: APA/EWA Rated Sheathing or Structural I, Grade C-D Exposure Durability 1, sanded, 3/4 inches thick.

##### 2.2. ACCESSORIES

- 2.2.1. Fasteners and Anchors:
  - 2.2.1.1. Material and Finish: Hot-dip galvanized steel.

- 2.2.1.2. Anchors: Bolts for anchoring into masonry grout and concrete. Bolts for anchorages to steel. Decking screws for anchorages to sheet metal. Nails or screws for anchorages of wood to wood.

### 2.3. FACTORY WOOD TREATMENT

- 2.3.1. Fire Retardant (Pressure Treatment): Comply with American Wood Products Association (AWPA) Standard C20 for lumber and C27 for plywood as a minimum for fire retardant treatment. Treatment also shall provide decay resistance and be kiln dried after treatment to a moisture content of 19 percent. Provide treatment marking on lumber and plywood. An acceptable treatment product is Exterior Fire-X manufactured by Hoover Treated Wood Products, Inc., telephone 800-832-9663.

## PART 3 EXECUTION

### 3.1. EXAMINATION AND PREPARATION

- 3.1.1. Examination: Verify substrate conditions are ready to receive framing, blocking, and deck sheathing.
- 3.1.2. Preparation: Coordinate nailers, blocking and framing items, and plywood deck sheathing with the work of other sections.

### 3.2. INSTALLATION

- 3.2.1. Field Cuts: Do not rip or mill fire retardant treated lumber. Ends cuts, drilling holes and joining cuts, and cutting plywood are permitted.
- 3.2.2. Set members level and plumb and in correct position.
- 3.2.2. When fire retardant treated lumber will be placed in direct contact with masonry, grout or concrete, provide a strip of No. 30 felt between wood and cementitious substrate.
- 3.2.3. Place horizontal members with crown side up.
- 3.2.3. Provide wood nailers as indicated on the Drawings. Where multiple members are used stagger end joints of adjacent layers a minimum of 12 inches.

### 3.3. FASTENING

- 3.3.1. Coordinate with Maintenance Building ceiling decking indicated on the Drawings, cabinets specified in Section 06410, roofing specified in Section 07511, gypsum board assemblies specified in Section 09260, toilet accessories specified in 10800, and plumbing fixtures scheduled on the Drawings.
- 3.3.2. Pre-bore wood and substrate to receive bolts and screws.
- 3.3.3. Remove split members and replace with sound members complying with the specified requirements.
- 3.3.4. Bolting:
  - 3.3.4.1. Drill holes 1/16 inch larger in diameter than bolts being used.
  - 3.3.4.2. Drill straight and true from one side only.

- 3.3.4.3. Do not bear threads on wood but use washers under head and nut where both or either bear on wood, and use washers under nuts.
- 3.3.4.4. When bolts and screws would interfere with the proper installation of subsequent work, recess or countersink washers and heads of fasteners.
- 3.3.4. Screws: For lag screws and wood screws, pre-bore holes for the same diameter as root of threads, enlarging holes to shank size diameter for length of shank.
- 3.3.5. Spacings: Fasten wood nailers to substrates at spacings not to exceed 48 inches for bolts and 24 inches for screws, and, in either case, within 16 inches of corners and end joints of nailers.

**END OF SECTION**

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## SECTION 07191

### WATER REPELLANT PENETRANT

#### PART 1 GENERAL

##### 1.1. SECTION INCLUDES

- 1.1.1. Water repellent liquid applied to exterior concrete masonry surfaces.

##### 1.2. RELATED SECTIONS

- 1.2.1. Section 04813 – Masonry Veneer: Exterior masonry veneer to receive the work of this Section.
- 1.2.2. Section 04815 – Single Wythe Unit Masonry: Exterior masonry wall to receive the work of this Section.
- 1.2.3. Section 07900 – Joint Sealers: Sealers material to be applied prior to the work of this Section.

##### 1.3. SYSTEM DESCRIPTION

- 1.3.1. Applied Penetrant: A water repelling product that exhibits an ability to restrict water absorption in concrete masonry to a maximum of 4 percent after treatment without appreciably altering the surface color, texture or natural appearance of the concrete masonry.

##### 1.4. SUBMITTALS FOR REVIEW

- 1.4.1. Section 01001 – Basic Requirements: Procedures for submittals.
- 1.4.2. Product Data: Provide details of product description, tests performed, limitations to coating, and chemical properties including percentage of solids.

##### 1.5. SUBMITTALS FOR INFORMATION

- 1.5.1. Manufacturer's Application Instructions: Indicate special procedures and conditions requiring special attention; cautionary procedures required during application.

##### 1.6. QUALITY ASSURANCE

- 1.6.1. Manufacturer: Company specializing in manufacturing the Products specified in this Section with minimum five years documented experience.
- 1.6.2. Applicator: Company specializing in performing the work of this Section with minimum three years experience and approved by manufacturer.

## 1.7. DELIVERY, STORAGE, AND HANDLING

- 1.7.1. Deliver, store, protect, and handle products to and at site under provisions of Division 1.
- 1.7.2. Protect coating liquid from freezing.

## 1.8. ENVIRONMENTAL REQUIREMENTS

- 1.8.1. Do not apply coating when temperature is lower than 50 degrees F (10 degrees C) or higher than 100 degrees F (38 degrees C) and ensure that that temperature range is maintained for 24 hours after application.
- 1.8.2. Do not apply coating when wind velocity is higher than 15 mph.

## 1.9. WARRANTY

- 1.9.1. Correct defective work within a five-year period after Date of Substantial Completion.

# PART 2 PRODUCTS

## 2.1. MANUFACTURERS

- 2.2.1. Chemprobe Technologies, Inc., telephone 214-271-5551; Product: Prime A Pell 200 or Prime A Pell Plus.
- 2.2.2. Other Acceptable Manufacturers:
  - 1) Huls America, Inc., telephone 800-828-0919; Product: Chem-Trete PB or AquaTrete.
  - 2) Harris Specialty Chemical, Inc., telephone 800-322-7825; Product: Environseal Double 7 for Block.
  - 3) Okon, Inc., telephone 303-232-3571; Product: Okon W-2.
  - 4) Sonneborn Chemrex, Inc., telephone 800-433-9517; Product: Sonneborn Penetrating Sealer 20.

## 2.2. MATERIALS

- 2.2.1. Coating: Siloxane or Silane; colorless, containing a minimum of 7 percent solids by weight.

# PART 3 EXECUTION

## 3.1. EXAMINATION

- 3.1.1. Before starting, verify that field conditions are acceptable and are ready to receive work.

- 3.1.2. Verify that joint sealants are installed and cured.
- 3.1.3. Verify that surfaces to be coated are dry, clean, and free of efflorescence, oil, or other material detrimental to application of coating.

### 3.2. PREPARATION

- 3.2.1. Delay work until masonry mortar substrate is cured a minimum of 30 days.
- 3.2.2. Remove loose particles and foreign matter.
- 3.2.3. Remove oil and foreign substance using a chemical solvent which will not affect masonry or coating.
- 3.2.4. Scrub and rinse surfaces to receive coating using clean water and allow to dry.

### 3.3. APPLICATION

- 3.3.1. Apply coating in accordance with manufacturer's instructions.
- 3.3.2. Apply coating at a rate of approximately one oz per sq ft of surface area using low pressure airless spray equipment flooding the surface of the masonry. Verify required coverage rate with manufacturer and adjust coverage consistent with manufacturer's instructions.
- 3.3.3. Apply two continuous, uniform coats. Allow drying time between coats as instructed by manufacturer.

### 3.4. PROTECTION OF FINISHED AND ADJACENT WORK

- 3.4.1. Protect adjacent surfaces not scheduled to receive coating.
- 3.4.2. Protect property and vehicles.
- 3.4.3. When applied to unscheduled surfaces, remove coating material immediately using a method as instructed by coating manufacturer.

**END OF SECTION**

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## SECTION 08110

### STANDARD STEEL DOORS AND FRAMES

#### PART 1 GENERAL

##### 1.1. SECTION INCLUDES

- 1.1.1. Steel doors and frames; rated and non-rated and thermally insulated.
- 1.1.2. Interior steel window frames; rated..

##### 1.2. RELATED SECTIONS

- 1.2.1. Section 04815 – Single-Wythe Unit Masonry: Concrete masonry walls into which the work of this Section is to be built.
- 1.2.2. Section 08710 - Door Hardware: Door hardware, silencers, and weatherstripping.
- 1.2.3. Section 08800 – Glazing: Glazing for standard steel interior window frames.
- 1.2.4. Section 09900 – Paints and Coatings: Field painting of doors.

##### 1.3. SUBMITTALS

- 1.3.1. Section 01001 - Basic Requirements: Submittals procedures.
- 1.3.2. Shop Drawings: Indicate door and frame elevations and sections, internal reinforcement, cut-outs, and finish. Indicate doors in relation to the marks used on the door schedule on the Drawings.
- 1.3.3. Product Data: Indicate door, frame and location of cut-outs for hardware reinforcement, frame anchors, and fasteners to wall construction.

##### 1.4. QUALITY ASSURANCE

###### 1.4.1. Conform to the following:

- 1) ANSI A115.2: Standard Steel Door and Frame Preparation for Bored or Cylindrical Locks for 1-3/8 Inch and 1-3/4 Inch Doors.
- 2) ANSI A115.14: Preparation of Open Back Strikes.
- 3) ANSI A156.7: Template Hinge Dimensions.
- 4) ANSI/SDI A250.8 - SDI 100: Recommended Specifications for Standard Steel Doors and Frames.
- 5) ANSI/SDI A250.11: Recommended Erection Instructions for Steel Frames.
- 6) ANSI/SDI A250.6: Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
- 7) ANSI/SDI A250.4: Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcings.
- 8) ANSI A250.4: Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.

##### 1.5. DELIVERY, STORAGE, AND PROTECTION

- 1.5.1. Section 01001 - Basic Requirements: Transport, handle, store, and protect products.

1.5.2. Accept frames on site in manufacturer's packaging. Inspect for damage.

## 1.6. PROJECT CONDITIONS

1.6.1. Coordinate the work with frame opening construction and hardware installation.

1.6.2. When applicable, sequence installation to ensure wire connections are achieved in an orderly and expeditious manner.

## PART 2 PRODUCTS

### 2.1. DOORS AND FRAMES

#### 2.1.1. Acceptable Manufacturers:

- 1) Amweld Building Products, Inc., Garrettsville, OH 44231
- 2) Ceco Door Products, Brentwood, TN 37027
- 3) Curries Company, Mason City, IA 50401
- 4) Deansteel Manufacturing Company, San Antonio, TX 78204-1496
- 5) The Kewanee Corporation, Kewanee, IL 61443
- 6) Fenestra Corporation, Erie, PA 16505
- 7) Republic Builders Products, McKenzie, TN 38201
- 8) Steelcraft Metal Doors, Cincinnati, OH 45242
- 9) Tex-Steel Corporation, Harlingen, TX 78551

#### 2.1.2. Materials:

2.1.2.1. Door and Window Frames, Frame Anchors, and Hardware Reinforcings: Comply with the requirements of the performance levels specified.

2.1.2.2. Materials Used in Manufacture: Comply with ANSI/SDI A250.6 and A250.8.

2.1.2.3. Physical Performance Levels: Comply with ANSI/SDI A250.4.

2.1.2.4. Sheet Steel: Cold-rolled type conforming to ASTM A1008 and A568, or hot-rolled, pickled and oiled steel conforming to ASTM A1011 and A568.

2.1.3. Exterior and Interior Doors (Insulated): ANSI A250.8, 1-3/4 inches (44 mm), Level 2 Heavy Duty, Model 1, full flush design.

2.1.4. Exterior and Interior Frames: Level 2 Heavy Duty, minimum 16 gage thick material, core thickness, welded type.

2.1.5. Door Core: Steel channel grid or vertical steel stiffeners.

2.1.6. End Closure: Channel, 0.04 inch (1.2 mm) thick, flush.

2.1.7. Thermal Insulated Door: Total insulation R-Value of 7 (RSI value of 1.2), measured in accordance with ASTM C1363.

### 2.2. ACCESSORIES

2.2.1. Primer: ANSI A250.10 rust inhibitive epoxy polyamide type. Ensure compatibility with A60 galvanized steel.

## 2.3. FABRICATION - DOORS

- 2.3.1. Fabricate doors with hardware reinforcement welded in place.
- 2.3.2. Close top and bottom edge of exterior doors with inverted steel channel closure. Seal joints watertight.

## 2.4. FABRICATION - FRAMES

- 2.4.1. Masonry Frames: Fabricate frames as welded unit.
- 2.4.2. Fabricate frames with hardware reinforcement plates welded in place.
- 2.4.3. Fabricate frames to suit masonry wall coursing.
- 2.4.4. Fabricate loose steel stops for glazing of standard steel interior window frames. Provide oval head screws for installation of stops.

## 2.5. FINISH

- 2.5.1. Sheet Steel: Galvanized to ASTM A653/A653M A60 (ZF180).
- 2.5.2. Factory-Primed: Air dried primer as specified in ACCESSORIES above.
- 2.5.3. Field Painting: Specified in Section 09900.

# PART 3 EXECUTION

## 3.1. COORDINATION AND EXAMINATION

- 3.1.1. Verify existing conditions before starting work.
- 3.1.2. Verify that opening sizes and tolerances are acceptable.

## 3.2. INSTALLATION

- 3.2.1. Install doors and frames in accordance with ANSI A250.8.
- 3.2.2. Coordinate with wall construction for anchor placement.
- 3.2.3. Coordinate installation of doors and frames with installation of hardware specified in Section 08710.
- 3.2.4. Coordinate installation of steel window frames with installation of glazing specified in Section 08800.

## 3.3. TOLERANCES

- 3.3.1. Maximum Diagonal Distortion: 1/16 inch (1.5 mm) measured with straight edge, corner to corner.

## 3.4. ADJUSTING

- 3.4.1. Adjust doors for smooth and balanced door movement.

### 3.5. SCHEDULES

- 3.5.1. Refer to Door and Window Schedules on the Drawings for scheduling information of doors and frames.

**END OF SECTION**

**SECTION 08212**  
**FLUSH WOOD DOORS**

**PART 1 GENERAL**

**1.1. SECTION INCLUDES**

1.1.1. Flush wood doors, plastic laminate clad, fire-rated and non-rated.

**1.2. RELATED WORK**

1.2.1. Section 08151 – Interior Metal Door Frames: Metal door frames into which the wood doors are to be hung.

1.2.2. Section 08710 - Door Hardware: Hardware for use with the wood doors.

**1.3. REFERENCES**

1.3.1. Architectural Woodwork Institute: AWI – Quality Standards Illustrated.

1.3.2. National Electrical Manufacturers Association: NEMA LD 3 – High Pressure Decorative Laminate.

1.3.3. National Fire Protection Association:

- 1) NFPA 80 – Standard for Fire Doors, Fire Windows.
- 2) NFPA 252 – Standard Methods of Fire Tests of Door Assemblies.

1.3.4. Underwriters Laboratories Inc.: UL 10B – Fire Tests of Door Assemblies.

**1.4. SUBMITTALS**

1.4.1. Section 01001 – Basic Requirements: Submittal procedures.

1.4.2. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, factory machining criteria, and factory finishing criteria. Identify doors in relation to the door schedule on the Drawings.

1.4.3. Product Data: Submit information on door core materials and construction, and plastic laminate finish material.

1.4.4. Samples: Submit plastic laminate manufacturer's standard samples of available colors, textures, and patterns.

1.4.5. Manufacturer's Installation Instructions: Submit special installation instructions.

**1.5. QUALITY ASSURANCE**

1.5.1. Perform work in accordance with AWI Quality Standard Section 1300, Custom Grade.

1.5.2. Finish doors in accordance with AWI Quality Standard Section 1500.

1.5.3. Fire Door Construction: Conform to NFPA 252 or UL 10B.

- 1.5.4. Installed Fire Door Assembly: Conform to NFPA 80 for fire rated class as scheduled.
- 1.5.5. Manufacturer Qualifications: Company specializing in manufacturing products spection in this Section with minimum five years experience.

#### 1.6. DELIVERY, STORAGE, AND HANDLING

- 1.6.1. Section 01001 – Basic Requirements: Product storage and handling requirements.
- 1.6.2. Package, deliver and store doors in accordance with AWI Section 1300.

#### 1.7. COORDINATION

- 1.7.1. Coordinate the work of this Section with door opening construction, door frame and door hardware installation.

#### 1.8. WARRANTY

- 1.8.1. Furnish manufacturer's "Life of Installation" warranty for interior doors.
- 1.8.2. Include coverage for delamination of facing, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

### PART 2 PRODUCTS

#### 2.1. FLUSH WOOD DOORS

- 2.1.1. Product Description: Solid core wood doors; plastic laminate facing and edging material; fire rated and non-rated types; flush design wood doors.
  - 2.1.1.1 Flush Interior Solid Core Doors: 1-3/4 inches (44 mm) thick; solid core, seven ply construction, and fire rated as scheduled on the Drawings.

#### 2.2. COMPONENTS

- 2.2.1. Solid Core, Non-Rated: AWI Section 1300, Type SCL Structural Composite Lumber.
- 2.2.2. Solid Core, Fire Rated: AWI Section 1300, Type FD 1/3.
- 2.2.3. Plastic Laminate Facing and Edging: NEMA LD-3, General Purpose and Fire Rated Types, minimum of 0.050 inch (1.3 mm) thick, in color and finish as selected.
- 2.2.4. Cross Banding Behind Laminate Finish: Two ply; manufacturer's standard construction.
- 2.2.5. Facing Adhesive: Type I, waterproof.

#### 2.3. FABRICATION

- 2.3.1. Fabricate non-rated doors in accordance with the requirements of AWI Quality Standards Illustrated.

- 2.3.2. Fabricate fire-rated doors in accordance with AWI Quality Standards Illustrated and to UL requirements. Attach fire rating label to door.
- 2.3.3. Fabricate doors with hardware reinforcement blocking in place at lock edge and top of door for closer.
- 2.3.4. Vertical Exposed Edge of Stiles: Plastic laminate same as door facing. Fit edge cladding to door before applying facing.
- 2.3.5. Factory pre-fit doors for frame opening dimensions identified on shop drawings. Factory machine doors for finish hardware. Provide the door manufacturer with necessary hardware samples, templates, and frame and hardware schedules required to coordinate the work.
- 2.3.6. Provide edge clearances in accordance with AWI 1300.

#### 2.4. SHOP FINISH

- 2.4.1. Finish work in accordance with AWI – Section 1500 Factory Finishing, Custom Quality; plastic laminate cladding with plastic laminate vertical edges; plastic laminate color and texture as selected by the Architect/Engineer.
- 2.4.2. Seal door top and bottom edges with color sealer to match door facing color.

### PART 3 EXECUTION

#### 3.1. EXAMINATION

- 3.1.1. Section 01001 – Basic Requirements: Coordination and project conditions.
- 3.1.2. Verify that opening sizes and tolerances are acceptable.
- 3.1.3. Do not install doors in frame openings that are not plumb or are out of tolerance for size and alignment. Ensure that discrepancies are corrected.

#### 3.2. INSTALLATION

- 3.2.1. Install fire-rated doors in accordance with manufacturer's instructions and AWI Quality Standards Illustrated, NFPA 80, and to requirements for fire rating label by UL.
- 3.2.2. Install non-fire-rated doors in accordance with manufacturer's instructions and AWI Quality Standards Illustrated requirements, whichever are the most strict.
- 3.2.2. Coordinate installation of doors with installation of frames specified in Section 08115 and hardware specified in Section 08710.
- 3.2.3. Adjust door for smooth and balanced door movement, and adjust closer for full closure.

#### 3.3. INSTALLATION TOLERANCES

- 3.3.1. Conform to AWI requirements for fit and clearance tolerances and maximum diagonal distortion.

**END OF SECTION**

**SECTION 08520**  
**ALUMINUM WINDOWS**

**PART 1 GENERAL**

**1.1 SUMMARY**

1.1.1 Section includes aluminum windows.

**1.2 SYSTEM DESCRIPTION**

1.1.1. Aluminum Windows: Factory fabricated, factory finished, related flashings, anchors and attachment devices, trim, and sills.

1.1.2. Configuration: Conform with ANSI 101 Designations for windows required for Project; F-fixed non-operable, sash.

1.1.3. System Design: Design and size components to withstand dead loads and live loads caused by positive and negative wind loads acting normal to plane of wall as calculated in accordance with applicable code and as calculated in accordance with ASCE 7-05 to design pressure of 120 lb/sq ft (5.76 kPa) and as tested in accordance with ASTM E330 without glass breakage or permanent damage.

1.1.4. Wind-Borne Debris Loads: Design and size glass to withstand the following loads:

1.1.4.1. Glass Within 30 feet (9.144 m) of Grade: ASTM E1886 and ASTM E1996; large missile impact test.

1.1.5. Air Infiltration: Limit air leakage through assembly to 0.1 cfm/sq ft (1.7 cubic meters/hour/sq m) of wall area, measured at reference differential pressure across assembly of 6.24 psf (300 Pa) when tested in accordance with ASTM E283.

1.1.6. Water Leakage: None, when measured in accordance with AAMA/WDMA 101/I.S.2, ASTM E331 and ASTM E547 with test pressure difference of 20 percent of design pressure, with minimum differential of 2.86 lbf/sq ft (136.85 N/sq m) and maximum of 12.00 lbf/sq ft (574.2 N/sq m).

1.1.7. Condensation Resistance Factor (CRF): Not less than 64 frame and 56 glass when unit is tested in accordance with AAMA 1503-98.

1.1.8. Thermal Transmission Test (Conductive U-Value): U-Value not greater than 0.02 BTU/hr/sq ft/F when unit is tested in accordance with AAMA 1503-98.

1.1.9. System Internal Drainage: Drain water entering framing system to exterior.

**1.2. SUBMITTALS**

1.2.1. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work; and installation requirements.

1.2.2. Product Data: Provide component dimensions, anchorage and fasteners, finish samples, test reports and warranties.

### 1.3. QUALITY ASSURANCE

1.3.1. Manufacturer and Installer: Company specializing in manufacturing commercial window units with minimum three years experience.

1.3.2. Perform Work in accordance with the following:

1.3.2.1. Aluminum Windows: Fabricate and label window assemblies in accordance with AAMA 101 for types of windows specified.

### 1.4. WARRANTY

1.4.1. Manufacturer's Warranties:

1.4.1.1. Windows: Furnish warranty against any defect in material and workmanship under normal use and service of windows for a period on one year from date of delivery.

1.4.1.2. Factory Finishes: Furnish five-year warranty.

1.4.1.3. Glass: Furnish five-year manufacturer warranty for insulated glass units as specified in Section 08800.

## PART 2 PRODUCTS

### 2.1. ALUMINUM WINDOWS

2.1.1. Manufacturer and Model: Peerless Products, Inc., P. O. Box 431, Fort Scott, KS 66701, telephone 866-420-4000; Model 4175 Thermal F-AW80 Fixed, 4-inch frame depth with wall fin for metal stud walls, and Model 4170 Thermal F-AW80 Thermal, 4-inch frame depth without wall fin for concrete masonry openings.

2.1.2. Other Acceptable Manufacturers: Window units of the following manufacturers are acceptable when respective unit is equivalent to the above specified unit:

- 1) The Baut Studios-Aluminum Windows
- 2) Custom Window Co.-Aluminum Windows
- 3) Desco Windows-Aluminum Windows
- 4) EFCO Corp.-Aluminum Windows
- 5) IBP Grid Systems, Inc.-Aluminum Windows
- 6) Kawneer Co. Inc.-Aluminum Windows
- 7) St. Cloud Windows Inc.-Aluminum Windows
- 8) Traco-Aluminum Windows
- 9) Wausau Metals-Aluminum Windows
- 10) YKK AP America, Inc.-Aluminum Windows
- 11) Substitutions: Permitted according to procedure specified in Section 01001.

2.1.3. Product Description:

2.1.3.1. Windows: Fixed, non-operable lights.

2.1.3.2. Frame: Thermally broken with interior portion of frame insulated from exterior portion glass stops of snap-on or screw fastened type.

## 2.2. COMPONENTS

- 2.2.1. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063-T5 or T6 alloy, tempered.
- 2.2.2. Fasteners: Aluminum, non-magnetic stainless steel or other material warranted by the manufacturer to be non-corrosive and compatible with aluminum window members, trim, anchors, and other components of the window units.
- 2.2.3. Thermal Barrier:
  - 2.2.3.1. Separate exterior aluminum from interior aluminum of frames by an integrally concealed, low-conductance structural thermal barrier in a manner that eliminates direct metal-to-metal contact with a de-bridge space of not less than 3/16 inch.
  - 2.2.3.2. Thermal Barrier Material: Poured-in-place two-part polyurethane of a type used in similar units for not less than two years and tested to demonstrate resistance to thermal conductance and condensation and having adequate strength and security of glass retention.
- 2.2.4. Glazing Beads: Extruded aluminum having sufficient strength to retain the glass based on performance requirements.
- 2.2.5. Glass and Glazing Materials: Specified in Section 08800.
- 2.2.6. Bituminous Paint: Asphaltic coating.
- 2.2.7. Anchor Devices: Non-corroding.
- 2.2.8. Sealant and Backing Materials: Specified in Section 07900.

## 2.3. FABRICATION

- 2.3.1. Fabricate framing, mullions and sash members with reinforced corners and joints. Supplement frame with internal reinforcement where required for structural rigidity.
- 2.3.2. Fabricate for re-glazing without having to dismantle the master frame.
- 2.3.3. Frame Wall Thickness: Minimum 0.062 inch (1.57 mm).
- 2.3.4. Frame Depth: Minimum 4 inches (102 mm).
- 2.3.5. Permit internal drainage weep holes and channels to encourage moisture migration to exterior.
- 2.3.6. Form glass stops, exterior sills, closures, weather stops, and flashings of same material as window frame.
- 2.3.7. Apply asphaltic paint to concealed metal surfaces in contact with cementitious surfaces or dissimilar metals.

## 2.4. TRIM AND SILLS

- 2.4.1. Material: Extruded aluminum finished to match window units.

- 2.4.2. Provide trim and sills pieces of types and sizes as manufactured by Peerless Products, Inc., Kawneer, and/or Alcoa as indicated on the Drawings
- 2.4.3. Receptors: Provide extruded aluminum two-piece aluminum receptor system for window units in masonry openings, such as Peerless No. 4110.

## 2.5. SHOP FINISHING

- 2.5.1. Exterior and Interior Surfaces: Finish exposed areas of aluminum windows and components with electrolytically deposited anodic coating in accordance with Aluminum Association Designation AA-M10-C22-A41 or A31, Clear Anodized Class I or II, AAMA Specification 611-98.
- 2.5.2. Concealed Steel Items (if any): Galvanize to 2.0 oz/sq ft (610 g/sq m).
- 2.5.3. Apply bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

## PART 3 EXECUTION

### 3.1. EXAMINATION

- 3.1.1. Verify rough openings are correctly sized and located.

### 3.2. PREPARATION

- 3.2.1. Prepare opening to permit correct installation of frame and achieve continuity of air and vapor retarder seal.

### 3.3. INSTALLATION

- 3.3.1. Install window units and accessories in accordance with manufacturer's instructions.
- 3.3.2. Use anchorage devices to securely attach frames to wall framing separating aluminum from dissimilar metals and other corrodible surfaces.
- 3.3.3. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- 3.3.4. Coordinate attachment and seal of air and vapor retarder materials. Fully apply spray foam-type insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- 3.3.5. In masonry openings, install two-piece receptors at head and jambs to receive window unit.
- 3.3.6. Install perimeter trim, window sills, and aprons as indicated. Conceal fasteners to the extent possible.
- 3.3.7. Coordinate installation of perimeter sealants and backing materials with Section 07900.

3.4. FIELD QUALITY CONTROL

3.4.1. Inspection will monitor quality of installation and glazing.

3.4.2. Test to AAMA 501, ASTM E1105 or AAMA 503, as applicable.

3.5. CLEANING AND PROTECTION

3.5.1. After installation, inspect window units, adjust, and promptly clean to prevent damage to finish and glazing.

3.5.2. Remove excess sealant, labels, dirt and other substances.

3.5.3. Initiate protection and other precautions required to ensure that units will be without damage and deterioration until time of acceptance by Owner.

3.6. SCHEDULES

3.6.1. Refer to Window Schedules on the Drawings.

**END OF SECTION**

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**SECTION 08710**  
**DOOR HARDWARE**

**PART 1 GENERAL**

1.1. SECTION INCLUDES

- 1.1.1. Hardware for wood, aluminum and hollow steel doors.
- 1.1.2. Thresholds and weatherstripping

1.2. RELATED SECTIONS

- 1.2.1. Section 06410 - Custom Casework: Cabinet hardware.
- 1.2.2. Section 08110 – Standard Steel Doors and Frames: Standard steel doors and frames requiring templates for frame preparation.
- 1.2.5. Section 08120 – Exterior Aluminum Doors and Frames: Exterior aluminum-framed doors and frames.
- 1.2.3. Section 08151 – Interior Aluminum Door Frames: Aluminum frames requiring templates for frame preparation.
- 1.2.4. Section 08212 - Flush Wood Doors: Pre-machined wood doors and execution requirements for templates for door preparation.

1.3. SUBMITTALS

- 1.3.1. Shop Drawings and Product Data: Indicate locations and mounting heights of each type of hardware, schedules, catalog cuts, templates, and connection requirements.
- 1.3.2. Operating and Maintenance Instructions: Include data on operating hardware, lubrication requirements, parts lists, and inspection procedures related to preventative maintenance.

1.4. QUALITY ASSURANCE

- 1.4.1. Perform Work in accordance with ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People, Texas Accessibility Standards, and Americans with Disabilities Act.
- 1.4.2. Hardware Supplier: Company specializing in supplying commercial door hardware with minimum of five years experience and approved by manufacturer.
- 1.4.3. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant or other qualified person to assist in the work of this Section.
- 1.4.3. Hardware Installer Personnel: Employ qualified persons trained and experienced in the installation of door hardware of the types specified herein. At the Contractors option, hardware for aluminum doors specified in Section 08120 may be installed at door manufacturer's factory.

1.5. COORDINATION

- 1.5.1. Coordinate work of this Section with other directly affected sections requiring integral reinforcement for door hardware.
- 1.5.2. Provide templates to those providing work in other sections so that they can prepare their products to receive the hardware specified herein.
- 1.5.3. Coordinate the Owner's keying requirements during the course of the Work.

1.6. DELIVERY, STORAGE, AND HANDLING

- 1.6.1. Package hardware items individually. Label and identify package with door opening code to match schedule.
- 1.6.2. Deliver keys to Owner by security shipment direct from hardware supplier.

1.7. MAINTENANCE

- 1.7.1. Provide special wrenches and tools applicable to each different or special hardware component.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- 2.1.1. For each of the required items of finish hardware, provide items from the specified manufacturer or from one of the indicated acceptable substitutes:

<u>Items</u>	<u>Manufacturer</u>	<u>Acceptable Substitute</u>
Butts	Stanley	Hager, McKinney or Soss
Locks	Corbin Russwin	Owner's preference
Closers	Corbin Russwin	Norton
Exit Devices	Corbin Russwin	Dor-O-Matic, Adams Rite or Von Duprin
Stops & Holders	Ives	Trimco or Glenn Johnson
Door Bottoms	Reese	National Guard, Pemko or Zero
Thresholds	Zero	National Guard, Pemko or Reese
Weatherstripping	Zero	National Guard, Pemko or Reese

- 2.1.2. Where possible, use products of same manufacture for each type of item. Coordinate with the products and work specified in Sections 08110, 08151, 08212, and 08410.

2.2. KEYING

- 2.2.1. Door Locks: Grand master keyed. Obtain keying information from Owner with tenant approval.
- 2.2.2. Supply three keys for each lock, and supply three master keys and three grand master keys.

2.3. FINISHES

- 2.3.1. Finishes are identified by BHMA number or manufacturer's identification symbol in Schedule at end of this Section.

## 2.4. ALUMINUM RAIN DRIP

- 2.4.1. Zero No. 11 extruded aluminum watershed; provide stainless steel fasteners.

## PART 3 EXECUTION

### 3.1. EXAMINATION AND PREPARATION

- 3.1.1. Verify that doors and frames are ready to receive work and dimensions are as indicated.

### 3.2. INSTALLATION

- 3.2.1. Install hardware in accordance with manufacturer's instructions.
- 3.2.2. Use templates provided by hardware item manufacturer.
- 3.2.3. Mounting heights for hardware from finished floor to center line of hardware item, as applicable refer to:
  - 1) Sections 08121 and 08212.
  - 2) DHI WDMS 3.
  - 3) DHI A115 Series.
  - 4) Texas Accessibility Standard (TAS): When a conflict arises between the TAS and other references, the TAS shall govern.
- 3.2.4. Installation of Aluminum Rain Drips: Install above all doors and others openings where indicated on the Drawings using stainless steel fasteners appropriate to the substrate and spaced as recommended by the drip manufacturer. Set rain drips to substrate in a full bed of sealant.

### 3.3. FIELD QUALITY CONTROL

- 3.3.1. Provide certification from Architectural Hardware Consultant that consultant has inspected the installation and certifies that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

### 3.4. ADJUSTING

- 3.4.1. Adjust hardware for smooth operation.

### 3.5. PROTECTION OF FINISHED WORK

- 3.5.1. Do not permit adjacent work to damage hardware or finish.

### 3.6. SCHEDULE

- 3.6.1. General: An hardware set type designates items required for either a single door or a pair of doors, as the case may be, and the respective manufacturer's catalog number and finish for each item. Refer to each building's respective Door Schedule on the Drawings for door and frame types. Refer to each building's Floor Plan on the Drawings for door locations, door swings, and wall types.

3.6.2. Administration Building Hardware Sets:

3.6.2.1. Exterior Doors:

Set No. AE-1: All pairs of Doors to have: Interior pairs, no sweeps or weatherstripping

3 Pair Butts	FBB 191 4.5 x 4.5 NRP 630
Set of Exist Devices, Vertical Rod x Rim	ED8400 x ED8200 x S01 630 N157 x N150 Levers 630
2 Each Closers	DC 3210-SBL
2 Each Floor Stops/holders	FS446, FS450 630
1 Each Threshold	566A x 72"
2 Each Door Bottom Sweeps	345AV x 36"
Weatherstripping	Provided in Section 08120

Set No. AE-2: All exterior single doors to have:

1-1/2 Pair Butts	FBB 191 4.5 x 4.5 NRP 630
1 Each Exit Device	ED8200 x N157 US 630
1 Each Rim Cylinder	3010 x 200 x L4 US 630
1 Each Closer	DC 3210-SBL
1 Each Floor Stop/holder	FS446, FS450 630
1 Each Threshold	566A x 36"
1 Each Door Bottom Sweep	345AV x 36"
Weatherstripping	Provided in Section 08120

3.6.2.2. Interior Doors:

Set No. AI-1: All single interior classroom doors to have:

1-1/2 Pair Butts	FBB 179 4.5 x 4.5 626
1 Each Lockset	CL3261NSD 626 (F82)
1 Each Closer	DC 3210-SBL
1 Each Wall Stop	407-1/2 626

Set No. AI-2: Toilets to have:

1-1/2 Pair Butts	FBB 179 4.5 x 4.5 626
1 Set Push/Pull	8103-0 x 8200 630
1 Each Closer	DC 3210-SBL
1 Each Wall Stop	407-1/2 626

Set No. AI-3: Custodial room to have:

1-1/2 Pair Butts	FBB 179 4.5 x 4.5 626
1 Each Privacy Set	CL3257NSD 626 (F86)
1 Each Closer	DC 3210-SBL
1 Each Wall Stop	407-1/2 626

**END OF SECTION**

## SECTION 08800

### GLAZING

#### PART 1 GENERAL

##### 1.1. SECTION INCLUDES

- 1.1.1. Glass and glazing for sections referencing this Section for Products and installation.

##### 1.2. RELATED WORK

- 1.2.1. Section 08110 – Standard Steel Doors and Frames: Standard steel window frames to receive glazing
- 1.2.2. Section 08410 – Exterior Aluminum Doors and Frames: Aluminum doors to receive glazed lights.
- 1.2.3. Section 08520 - Aluminum Windows: Aluminum windows to receive glazing.

##### 1.3. SYSTEM DESCRIPTION

- 1.3.1. Glass and glazing materials of this section shall provide continuity of building enclosure air barrier and vapor retarder.
- 1.3.2. Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass. For exterior glazing, use a design wind velocity of 110 mph (3-second gusts) in compliance with ASCE-7-05.

##### 1.4. SUBMITTALS

- 1.4.1. Product Data on Glass Types Specified: Provide physical and environmental characteristics, size limitations, and special installation requirements.
- 1.4.2. Product Data on Glazing Compounds: Provide chemical characteristics, limitations, special application requirements. Identify available colors.

##### 1.5. QUALITY ASSURANCE

- 1.5.1. Perform Work in accordance with GANA Glazing Manual, FGMA Sealant Manual, SIGMA, and GANA Laminated Glazing Reference Manual, for glazing installation methods.
- 1.5.2. Conform to ANSI Z97.1 for safety glazing.

##### 1.6. WARRANTY

- 1.6.1. Provide five-year warranty under provisions of Section 01001 including coverage for failure in materials and workmanship and leaks exceeding the limits set forth in the System Description article of Sections 08410 and 08520.
- 1.6.2. Provide five-year warranty under provisions of Section 01001 including coverage for sealed glass units from seal failure, interpane dusting, misting, and replacement of defective glass.
- 1.6.3. Provide five-year warranty under provisions of Section 01001 including coverage for delamination of laminated glass and replacement of defective glass.

## PART 2 PRODUCTS

### 2.1. FLOAT GLASS MATERIALS

- 2.1.1. Clear Heat Strengthened Glass (Type FG-CH): ASTM C1048, Kind HS heat strengthened, Condition A uncoated, Type 1 transparent flat, Class 1 clear, Quality q3 glazing sheet.
- 2.1.2. Tinted Heat Strengthened Glass (Type FG-TH): ASTM C1048, Kind HS heat strengthened, Condition A uncoated, Type 1 transparent flat, Class 3 tinted light reducing, Quality q3 glazing sheet. Performance data based on 1/8-inch thick layer for laminated glass:
  - 1) Tint: Gray
  - 2) Visible Light Transmittance: 69 percent.
  - 3) Shading Coefficient: 0.86
  - 4) Direct Solar Energy Transmission: 67 percent.
- 2.1.3. Safety Glazing (Type SG): Conform to ANSI Z97.1, minimum thickness 1/4 inch (6 mm).
  - 2.1.3.1. Tinted Laminated Glass (Type SG-TL-1): Kind LHS, tinted/clear heat strengthened glass with plastic interlayer.
    - 1) Outerlayer: Kind HS, tinted heat strengthened glass (Type FG-TH).
    - 2) Interlayer: Polyvinyl butyral.
    - 3) Innerlayer: Kind HS, clear heat strengthened glass (Type FG-CH).

### 2.2. FLOAT GLASS PRODUCTS

- 2.2.1. Float Glass Manufacturers:
  - 1) ACH Glass Operations
  - 2) AFG Industries, Inc.
  - 3) Guardian Industries Corp.
  - 4) PPG Industries
  - 5) Pilkington North America, Inc.
- 2.2.2. Clear Glass (FG-CH): Heat strengthened float glass as specified' Class 1 clear, minimum 1/4 inch (6 mm) thick, except 1/8 inch (3 mm) for use in laminated glass.
- 2.2.3. Tinted Glass (FG-TH): Heat strengthened float glass as specified' Class 2 tinted gray, minimum 1/4 inch (6 mm) thick.
- 2.2.3. Low E Glass (FG-ETH): Heat strengthened float glass as specified' Class 2 tinted gray, minimum 1/4 inch (6 mm) thick, except 1/8 inch (3 mm) for use in laminated glass.

### 2.3. LAMINATED GLASS PRODUCTS

- 2.3.1. Laminated Glass Manufacturers:
  - 1) ACH Glass Operations
  - 2) AFG Industries, Inc.
  - 3) Guardian Industries Corp.
  - 4) Oldcastle Industries Corp.
  - 5) Viracon
- 2.3.2. Laminated Glass: ASTM C1172 with plastic interlayer.

- 2.3.2.1. Clear Laminated Glass (LG-CH): Clear heat strengthened glass as specified, 1/4 inch thick with minimum 0.030 inch thick plastic interlayer.
- 2.3.2.2. Tinted Laminated Low E Glass (LG-ETH): Gray tinted heat strengthened glass as specified, 1/4 inch thick with minimum 0.030 inch thick plastic interlayer.
- 2.3.2.3. Safety Glass: Conform to CPSC 16 CFR 1201, Category I or II as applicable.

## 2.4. FIRE RESISTIVE GLASS PRODUCTS

### 2.4.1. Fire Resistive Glass Manufacturers:

- 1) Pilkington
- 2) Technical Glass Products
- 3) SAFTI First
- 4) Vetrotech Saint-Gobain North American, Inc.

2.4.2. Clear Fire Resistive Film-Faced Ceramic Glass (FRG-FC): Clear, transparent polished both surfaces, faced one side with clear plastic glazing film, 3/16 inch (5 mm) thick.

2.4.3. Clear Fire Resistive Gel-Filled Ceramic Glass (FRG-GC): Clear tempered fire resistive safety glazing fabricated from two lites of tempered glass as specified, gel filled and sealed, manufacturer's standard thickness for applications indicated.

2.4.4. Fire Rating: 60 minute rating as listed in UL Building Materials Directory and approved by authority having jurisdictions for applications indicated.

2.4.5. Safety Glazing: Comply with CPSC 16 CFR 1201, Category II.

## 2.5. INSULATING GLASS PRODUCTS

### 2.5.1. Insulating Glass Manufacturers:

- 1) PAFG Industries, Inc.
- 2) Arch Aluminum and Glass
- 3) Guardian Industries Corp.
- 4) Oldcastle Industries Corp.
- 5) PPG Industries
- 6) Viracon

2.5.2. Insulating Glass: ASTM E2190 certified by Insulating Glass Certification Council; with glass elastomer or silicone sealer edge seal; purge interpane space with dry hermetic air.

2.5.2.1. Outer Pane: Gray tinted Low E laminated Type LG-ETH, minimum 1/4 inch (6 mm) thick.

2.5.2.2. Inner Pane: Clear laminated Type LG-CH, minimum 1/4 inch (6 mm) thick.

2.5.2.3. Total Unit Thickness: One inch (25 mm).

2.5.2.4. Insulating Glass Unit Edge Seal Construction: Stainless steel, thermally broken, bent and spot welded.

## 2.6. GLAZING SEALANTS

- 2.6.1. Elastomeric Glazing Tapes: Materials compatible with adjacent materials including glass, laminated glass core, insulating glass seals, and glazing channels.
  - 2.6.1.1. Silicone Glazing Sealant: ASTM C920, Type S, Grade NS, Class and Use suitable for glazing application indicated; chemical curing; capable of water immersion with loss of properties; non-bleeding, non-staining, cured Shore A hardness of 15 to 25, black color
- 2.6.2. Dense Gaskets: Resilient extruded shape to suit glazing channel retaining slot; black color; neoprene per ASTM C664, EPDM per ASTM C864, or Silicone per ASTM C1115.
- 2.6.3. Soft Gaskets: ASTM C509, resilient extruded shape to suit glazing channel retaining slot; black color; neoprene, EPDM, or Silicone.
- 2.6.4. Pre-Formed Glazing Tape: Preformed butyl compound with integral resilient tube spacing device, sized to suit application, 10 to 15 Shore A durometer hardness, black color.

## 2.7. GLAZING ACCESSORIES

- 2.7.1. Setting Blocks: Neoprene; 80 to 90 Shore A Durometer hardness.
- 2.7.2. Spacer Shims: Neoprene; 50 to 60 Shore A durometer hardness, self adhesive on one face.
- 2.7.3. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device.
- 2.7.4. Glazing Spline or Gasket: Resilient polyvinyl chloride extruded shape to suit glazing channel retaining slot; black color.
- 2.7.5. Fire Resistant Glazing Materials: Materials used to obtain required fire-resistant rating.

## PART 3 EXECUTION

### 3.1. EXAMINATION AND PREPARATION

- 3.1.1. Verify that openings for glazing are correctly sized, within tolerance, and glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.
- 3.1.2. Clean and prime surfaces scheduled to receive sealant.

### 3.2. INSTALLATION

- 3.2.1. Perform installation in accordance with GANA Glazing Manual. Comply with ASTM C1193 for glazing sealants and NFPA 80 for fire-rated openings.
- 3.2.2. Exterior Wet/Dry Method (Preformed Tape and Sealant) Installation:
  - 3.2.2.1. Cut glazing tape to length and set against permanent stops, 3/16 inch (5 mm) below sight line. Seal corners by butting tape and dabbing with compatible butyl sealant.
  - 3.2.2.2. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to

complete continuity of and vapor seal.

- 3.2.2.3. Place setting blocks at 1/3 points with edge block no more than 6 inches (150 mm) from corners.
- 3.2.2.4. Rest glazing on setting blocks and push against tape and heel bead of sealant with
- 3.2.2.5. Where applicable, installed removable stops with spacer stops inserted between glazing and applied stops, 1/4 inch (6 mm) below sight line. Place glazing tape on glazing pane 1/4 inch (6 mm) below sight line.
- 3.2.2.6. Fill gap between glazing and stop with elastomeric glazing sealant to depth equal to bit of frame on glazing, but not more than 3/8 inch (9 mm) below sight line.
- 3.2.2.7. Apply cap bead of elastomeric glazing sealant along void between stop and glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

### 3.2.3. Interior Butt Glazed Method (Sealant Only) Installation:

- 3.2.3.1. Temporarily brace glass in position for duration of glazing process. Mask edges of glass at adjoining glass edges and between glass edges and framing members.
- 3.2.3.2. Temporarily secure small diameter non-adhering foamed rod on back side of joint.
- 3.2.3.3. Apply sealant to open side of joint in continuous operation; thoroughly fill joint without displacing foam rod. Tool sealant surface smooth to concave profile.
- 3.2.3.4. Permit sealant to cure then remove foam backer rod. Apply sealant to opposite side, tool smooth to concave profile.
- 3.2.3.5. Remove masking tape.

## 3.3. CLEANING

- 3.3.1. Remove glazing materials from finish surfaces.
- 3.3.2. Remove labels after Work is complete.
- 3.3.3. Clean glass and adjacent surfaces.

## 3.4. SCHEDULE

- 3.4.1. Exterior Windows: Insulating glass units, exterior wet/dry method with silicone glazing sealant.
- 3.4.2. Exterior Doors: Type – LG-ETH, gray tinted/clear laminated heat strengthened glass with plastic interlayer, minimum 1/4-inch (6 mm) thick, exterior wet/dry method with silicone glazing sealant.
- 3.4.3. Interior Windows: Type – FRG-FC or FRG-GC, clear heat strengthened glass, minimum 3/16-inch (4.8 mm) thick, fire-resistive glazing materials.

**END OF SECTION**

**END OF SECTION**

- 3.3.1. Repair damaged and defective woodwork, and where not possible to repair properly, replace woodwork at no additional cost to the Owner.
- 3.3.2. Lubricate, make final adjustments, and clean hardware.
- 3.3.3. Clean all exposed and semi-exposed surfaces.
- 3.3.4. Protection: Installer shall advise the Contractor of methods and conditions necessary for protection of the woodwork to the time of acceptance, and the Contractor shall provide that protection.

**3.3. ADJUSTMENT, CLEANING, AND PROTECTION**

- 3.2.6. Storage Shelf Units: Install ¾-inch plywood shelf units using ¾-inch wide solid wood spaces between units and between units and side wall finish as indicated. Secure units to and through spaces to each other and to walls. Stiffen front and rear edges of shelves using either a 1x2 wood strip applied to edge flush with top of shelf or a 7/8 inch x 7/8 inch x 1/8 inch extruded aluminum angle with horizontal leg screwed on 10 inch centers to bottom of shelf and vertical legs against front and rear edges of shelf. Prepare shelves and cleats for painting specified in Section 09900.
- 3.2.5. Countertop, Work Surface and Splash: Anchor securely to base unit or wall, as the case may be. Provide vertical supports for countertops and work surfaces at locations not greater than 48 inches apart using plywood brackets, partitions, or metal work surface support brackets specified above.
- 3.2.4. Casework: Install without distortion so that doors will fit openings properly and be accurately aligned. Adjust hardware to center doors in openings and to provide unencumbered operation.
- 3.2.3. Anchor woodwork to built-in anchors, blocking or supports, or directly attach to adequate substrate or support.
- 3.2.2. Scribe and cut work to fit adjoining work with maximum gaps of 1/32 inch (1 mm). Do not use additional overlay trim for this purpose. Refinish cut surfaces or repair damaged finish at cuts.
- 3.2.1. Install the work rigid, plumb, level, true and straight.

3.2. INSTALLATION

- 3.1.3. Verify location and sizes of utility rough-in associated with the work of this Section.
- 3.1.2. Verify adequacy of backing and support brackets and framing.
- 3.1.1. Provide inserts and other anchoring and support devices to be built into substrate prior to construction of substrate and coordinate work with other trades.

3.1. PREPARATION

PART 3 EXECUTION

- 2.5.7. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Seal cut edges.
- 2.5.6. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
- 2.5.5. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arses.
- 2.5.4. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide recessed trim reveals for scribing and site cutting.
- 2.5.3. Doors: ¾ inch (19 mm) thick; overlay style.

- 2.3.9.2. Adhesive: Contact cement conforming to FS A-A-1936, or other bonding adhesive recommended by AWI and the plastic laminate manufacturer to suit the application.
- 2.3.10. Edge Band: Where indicated, use one of the following edge bands:
- 2.3.10.1. Self-Edge Band: Solid wood edging for gluing into a rabbeted v-groove.
- 2.3.10.2. Plastic Edge Band: Extruded flat-shaped; smooth finish with self-locking serrated tongue and of width to match component thickness, tan color.
- 2.3.10.2. Aluminum Edge Trim: Extruded flat-shaped; smooth finish with self-locking serrated tongue and of width to match component thickness, natural mill finish.
- 2.3.11. Cabinet Hardware and Accessory Materials:
- 2.3.11.1. Standards: Except as otherwise indicated, comply with ANSI A156.9 "American National Standard for Cabinet Hardware," Type 2 (Institutional) Quality Level.
- 2.3.11.2. Cabinet Hardware Schedule:
- 1) Pulls: Stanley No. 4484, one per door and one per drawer.
- 2) Hinges for Overlay Doors: Stanley No. 1592; two per door.
- 3) Catches: Stanley No. DP-41, magnetic catch; one per door up to 36 inches high and two per door over 36 inches high.
- 5) Shelf Standards and Rests: Formed steel channels and rests, cut for fitted rests spaced at one inch (25 mm) centers; satin finish.
- 4) Exposed Hardware Finish: Dull chrome, US26D, except as otherwise specified herein.
- 2.3.11.3. Work Surface Support: At Contractor's option, in lieu of plywood partition support, use Model SWS24 Large Basic Work Surface Support stamped metal bracket, size 24-1/4-inch by 18-1/4-inch, gray crinkle powder coat finish, manufactured by Doug Mockett & Company, Inc., telephone 800-235-7743; web site: [www.mockett.com](http://www.mockett.com).
- 2.4. OTHER MATERIALS
- 2.4.1. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer/Architect.
- 2.5. FABRICATION
- 2.5.1. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
- 2.5.2. Cap exposed plastic laminate finish edges with material of same finish and pattern.

- 2.3.9.1. Colors and Finish: A maximum of two solid colors, matt or satin finish, as selected by the Architect/Engineer from manufacturer's standard products.
- 1) Horizontal exposed surfaces: 0.050-inch thick, General Purpose Type (GP50).
- 2) Vertical surfaces and semi-concealed horizontal surfaces: 0.028-inch thick, General Purpose Type (GP28).
- 3) Interior cabinet liner: 0.020-inch thick, Cabinet Liner Type (CL20).
- 4) Concealed panel backing: 0.020-inch thick or thicker, Backer Type (BK20).

2.3.9. Plastic Laminate Overlays: High pressure decorative laminate sheets, comply with NEMA LD3 for type, thickness, color pattern and finish as specified for each of the following applications:

- 2.3.8. Fiberboard: ANSI A208.1; AWI standard, composed of wood chips, medium density, made with water resistive binders of grade to suit application; sanded faces.
- 2.3.7. Hardboard: ANSI A135.4; pressed wood fiber with resin binder tempered grade 1/4 inch (6 mm) thick, smooth two sides.
- 2.3.6. Concealed Solid Wood: No. 1 Grade species, WCLB or WWPFA graded material.
- 2.3.5. Solid Wood: AWI Custom Grade softwood. Comply with quality standards for selection of species, grade and cut fabricator's option unless otherwise indicated.
- 2.3.4. Interior Concealed Softwood Plywood: AWI Grade B veneer with medium density fiberboard core and type of glue recommended for application.
- 2.3.3. Softwood Plywood: AWI Grade A veneer with medium density fiberboard core and type of glue recommended for application.
- 2.3.2. Nails and Fastenings: Cadmium plated, chrome-plated, hot-dip galvanized, aluminum or stainless steel. For exposed fasteners, use oval head screws with finishing washers, stainless steel or chrome-plated.
- 2.3.1. Glue for Wood: Water resistant for interior use.

2.3. COMPONENTS

2.2.1. Use only kiln dried material or a moisture content within a 6 to 10 percent range. Maintain temperature and humidity during and after installation of millwork, so that the moisture content of wood is maintained with 1.0 percent tolerance of the above range.

2.2. MOISTURE CONTENT

- 1) Casework: AWI Custom Grade, except where the Drawings or Specifications require work of a better grade.
- 2) Storage Shelving: AWI Economy Grade.
- 3) Countertops: High pressure laminate, AWI Custom Grade.

## SECTION 09260

### GYPSUM BOARD ASSEMBLIES

#### PART 1 GENERAL

##### 1.1. SECTION INCLUDES

- 1.1.1. Metal stud wall framing.
- 1.1.2. Gypsum board, metal trim, and taped and sanded joint treatment.
- 1.1.3. Finish: Smooth finish to receive texture and paint specified in Section 09900.
- 1.1.4. Exterior Gypsum Board Sheathing over cold-formed exterior wall framing specified in Section 05400.

##### 1.2. RELATED SECTIONS

- 1.2.1. Section 05400 – MiscelCold-Formed Metal Framing: Exterior wall framing to receive exterior gypsum board sheathing.
- 1.2.2. Section 06114 – Miscellaneous Rough Carpentry: Wood blocking for support of casework, wall-mounted door stops, toilet accessories, shelving, and other wall-mounted accessories requiring solid support.
- 1.2.3. Section 07262 - Fluid-Applied Air and Vapor Barrier: Treatment to be applied to exterior face of gypsum board wall sheathing.
- 1.2.4. Section 08151 – Interior Aluminum Door Frames: Drywall type aluminum door frames.
- 1.2.5. Section 08305 - Access Doors and Frames: Product requirements for frames of metal access doors.
- 1.2.6. Section 10800 - Toilet Accessories: Product requirements for wall mounting toilet accessories.

##### 1.3. QUALITY ASSURANCE

- 1.3.1. Perform Work in accordance with ASTM C840 or applicable Gypsum Association (GA) publications GA-201 - Gypsum Board for Walls and Ceilings, and GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board, and GA-600 - Fire Resistance Design Manual.
- 1.3.2. Conform to applicable code for fire-rated assemblies as follows:
  - 1.3.2.1. One-Hour Fire-Rated Assembly Wall: Based on listed assembly by Underwriters Laboratories Inc. (UL) indicated on Drawings, or equivalent Factory Mutual or Gypsum Association (GA) assemblies
  - 1.3.2.2. Firestopped Head of Fire-Rated Partitions: Listed assembly by Warnock Hersey International, Inc. (WHI) Design Nos. FT/PV 60-01 (T & F Rating of 60 minutes).

## **PART 2 PRODUCTS**

### **2.1. GYPSUM BOARD SYSTEM**

#### **2.1.1. Manufacturers:**

- 1) **Domtar Gypsum, Ann Arbor, MI 48106; Gyproc Regular Gypsum Board and Gyproc Fireguard Gypsum Board.**
- 2) **Georgia-Pacific Corporation, Atlanta, GA 30303; G-P Gypsum Board and Firestop Gypsum Board, and Dens-Glass Gold.**
- 3) **Lousiana-Pacific Corporation, Portland, OR 97204-3601; Fiberbond Wallboard.**
- 4) **National Gypsum Company, Charlotte, NC 28211; Gold Bond Regular Gypsum Wallboard and Fire-Shield Wallboard.**
- 5) **Temple-Inland Forest Products Corporation, Diboll, TX 75941; Regular Gypsum Wallboard and Type X (Fire-Rated) Gypsum Wallboard.**
- 6) **United States Gypsum Company, Chicago, IL 60680-4124; Sheetrock and Firecode Sheetrock.**

2.1.2. **Studs and Tracks: ASTM C645; galvanized sheet steel, 25 gage thick, C shape, with serrated faces, and of sizes required in 3-5/8 inch and 6 inch depths.**

2.1.3. **Gypsum Board Types: 5/8 inch thick (16 mm), maximum permissible length; ends square cut, tapered edges; unless noted otherwise as follows:**

2.1.3.1. **Standard Type: ASTM C36.**

2.1.3.2. **Fire-Rated Type: ASTM C36, fire resistive, UL-rated.**

2.1.3.3. **Glass-Mat Gypsum Sheathing Board: ASTM C 1177, 1/2-inch thick regular type, long edge square; Dens-Glass Gold manufactured by Georgia-Pacific Corporation.**

### **2.2. ACCESSORIES FOR INTERIOR GYPSUM BOARD**

2.2.1. **Corner Beads: Metal, galvanized.**

2.2.2. **Edge Trim: GA 201 and GA 216, Type L bead.**

2.2.3. **Joint Materials: ASTM C475, reinforcing tape, joint compound, adhesive, and water.**

2.2.4. **Fasteners: ASTM C1002 Type S12 hardened screws.**

2.2.5. **Tie Wire: Double strand 16 gage galvanized tie wire.**

## **PART 3 EXECUTION**

### **3.1. EXAMINATION AND COORDINATION**

3.1.1. **Verify that site conditions are ready to receive work.**

SECTION 06410

ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.1. SECTION INCLUDES

- 1.1.1. Special fabricated cabinet, work counter sections, and storage shelf units.
- 1.1.2. Countertop and splash.
- 1.1.3. Cabinet hardware.
- 1.1.4. Prefinished surfaces.
- 1.1.5. Preparation for utilities.

1.2. RELATED SECTIONS

- 1.2.1. Section 06114 – Miscellaneous Rough Carpentry: Concealed support blocking.
- 1.2.2. Section 09650 - Resilient Flooring: Providing wall base in toe space.
- 1.2.3. Section 09900 – Paints and Coatings: Painting of casework and shelving not otherwise specified to be clad with plastic laminate.
- 1.2.4. Section 15400 – Plumbing Fixtures and Trim: Providing plumbing and plumbing fixtures.

1.3. REFERENCES

- 1.3.1. American National Standards Institute (ANSI):
  - 1) ANSI A135.4 – Hardboard.
  - 2) ANSI A156.9 – Cabinet Hardware.
  - 3) ANSI A208.1 – Mat-Formed Wood Particleboard.
- 1.3.2. American Woodwork Institute (AWI):
  - 1) AWI – Quality Standards Illustrated.
- 1.3.3. Federal Specification (FS):
  - 1) FS A-A-1936 – Adhesive, Contact, Neoprene Rubber.
- 1.3.4. National Electrical Manufacturers Association (NEMA):
  - 1) NEMA LD 3 – High Pressure Plastic Laminate.

1.4. SUBMITTALS

- 1.4.1. Section 01001 – Basic Requirements: Submittal procedures.
- 1.4.2. Shop Drawings: Submit shop drawings showing location of each item, dimensioned plans and elevations, large scale details, attachment devices and other components. Obtain field measurements and verify dimensions for accurate fit.
- 1.4.3. Product Data:

2.1.1. Architectural Woodwork: Except as otherwise shown or specified, comply with specified provisions of the Architectural Woodwork Institute (AWI) "Quality Standards" as follows:

2.1. QUALITY STANDARDS

PART 2 PRODUCTS

1.8.1. Verify field measurements prior to fabrication.

1.8. FIELD MEASUREMENTS

1.7.1. During and after installation of the work of this Section, maintain same temperature and humidity in building spaces as will occur after occupancy.

1.7. ENVIRONMENTAL REQUIREMENTS

1.6.3. Protect installed millwork during construction. Replace damaged materials or repair to the satisfaction of the Architect/Engineer.

1.6.2. Protect materials from water and perspiration stains. Replace such materials so damaged or stained.

1.6.1. Protect millwork against dampness during and after delivery. Store under cover in a well ventilated building and where not exposed to extreme changes of temperature or humidity. Do not store or install millwork in any part of the project until drywall work and other moisture producing construction are dry.

1.6. PRODUCT HANDLING

1.5.2. Fabricator Qualifications: Company specializing in manufacturing of the Products specified in this Section with minimum five years experience and licensed by AWI Quality Certification Program.

1.5.1. Perform work in accordance with AWI Custom quality standards, unless specified otherwise herein.

1.5. QUALITY ASSURANCE

1.4.4. Certification: Submit copy of fabricator's AWI Quality Certification Program license and Project specific letters.

1.4.3.4. Manufacturers' recommended methods of installation which, when approved by the Engineer/ Architect, will become the basis for acceptance or rejection of actual installation procedures used on the Work.

1.4.3.3. Samples of the full range of colors, patterns and textures available in each of the specified grades from the proposed manufacturers.

1.4.3.2. Manufacturer's specifications and other data needed to demonstrate compliance with the specified requirements.

1.4.3.1. Materials list of items proposed to be provided under this Section.

- 3.1.2. Coordinate with the work of other pertinent sections requiring openings in gypsum board surfaces that are to receive their respective product, such as door frames, access panels, and other items.
- 3.1.3. When openings are to be provided as the work of another section, such as penetrations for mechanical and electrical items and devices, ensure that proper methods are used in preparing the openings by providing assistance or instruction as required.

### 3.2. INSTALLATION OF INTERIOR METAL STUDS

- 3.2.1. Install studding in accordance with ASTM C754, GA-600, and manufacturer's instructions.
- 3.2.2. Metal Stud Spacing: Maximum 16 inches (406 mm) on center.
- 3.2.3. Partition Heights: To minimum 2 inches above suspended ceilings and full height to roof construction above, as indicated. Install additional bracing for partitions not extending to roof construction. Maintain clearance under structural building members to avoid deflection transfer to studs.
- 3.2.4. Door Opening Framing: Install double studs at door frame jambs.
- 3.2.6. Blocking: Nail wood blocking to studs. Install wood blocking specified in Section 06114 for support of casework, hardware, toilet accessories, plumbing fixtures, and other wall-mounted items.

### 3.3. INSTALLATION OF GYPSUM BOARD

- 3.3.1. Install gypsum board in accordance with GA-201, GA-216 and GA-600, as applicable, and manufacturer's instructions.
- 3.3.2. Erect single layer standard gypsum board in economical direction with ends and edges occurring over firm bearing.
- 3.3.3. Erect single layer fire-rated gypsum board with ends and edges occurring over firm bearing.
- 3.3.4. Fasten gypsum board to furring and framing with screws.
- 3.3.5. Place corner beads at external corners. Use longest practical length.
- 3.5.6. Place edge trim where gypsum board abuts dissimilar materials and at top edges of exposed partitions not otherwise extending above ceilings. At intersections with dissimilar materials, provide reveals for sealant.
- 3.5.7. Install glass-mat gypsum sheathing board over exterior metal framing specified in Section 05400 using corrosive resistant fasteners in accordance with manufacturer's instructions. Coordinate with the work of interfacing trades. Joint treatment and fluid-applied air and vapor barrier to be applied over sheathing is specified in Section 07262.

### 3.7. JOINT TREATMENT FOR INTERIOR GYPSUM BOARD

- 3.7.1. General: Comply with requirements of Gypsum Association document GA-216 for levels of joint treatment specified.

3.7.2. Use Level 1 finish for concealed surfaces 4 inches (100 mm) and higher above ceilings which surfaces need not be smoothed.

3.7.3. Use Level 4 finish for all exposed surfaces. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

3.7.3.1. Feather coats onto adjoining surfaces so that camber is maximum 1/16 inch (1.6 mm).

### 3.8. TOLERANCES

3.8.1. Maximum Variation from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

**END OF SECTION**

## SECTION 09300

### TILE

#### PART 1 GENERAL

##### 1.1. SECTION INCLUDES

- 1.1.1. Ceramic tile floor and walls and ceramic tile wall base.
- 1.1.2. Ceramic tile shower floor and walls.
- 1.1.3. Liquid-applied shower pan waterproofing.

##### 1.2. RELATED SECTION

- 1.2.1. Section 03300 – Cast-in-Place Concrete: Troweling of floor slab for tile application.
- 1.2.2. Section 04815– Single Wythe Unit Masonry: Concrete masonry walls for wall tile and wall tile base applications.
- 1.2.3. Section 09260 – Gypsum Board Assemblies: Gypsum board wall for wall tile and wall tile base applications.

##### 1.3. REFERENCES

###### 1.3.1. American National Standards Institute (ANSI):

- 1) ANSI A108.1 - Installation of Ceramic Tile, A collection.
- 2) ANSI A108.10 - Specifications for Installation of Grout in Tilework.
- 3) ANSI A108.4 – Installation of Ceramic Tile with Organic Adhesives or Water-Cleanable Epoxy Adhesive.
- 4) ANSI A108.5 - Specifications for Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
- 5) ANSI A108.10 – Installation of Grout in Tile Work.
- 6) ANSI A108.13 – Installation of Waterproof Membranes for Thin-Set Tile and Stone.
- 7) ANSI A118.1 - Standard Specification for Dry-Set Portland Cement Mortar.
- 8) ANSI A118.4 - Latex-Portland Cement Mortar.
- 9) ANSI A118.6 - Ceramic Tile Grouts.
- 10) ANSI A118.10 – Waterproof Membranes for Thin-Set Tile and Stone.
- 11) ANSI A136.1 – Organic Adhesives, Type I Adhesive and Type II Adhesive.
- 12) ANSI A137.1 - Ceramic Tile.

###### 1.3.2. Tile Council of America:

- 1) TCA - Handbook for Ceramic Tile Installation.

#### 1.4. SUBMITTALS

- 1.4.1. **Product Data:** Provide material specifications, characteristics, and instructions for using adhesives and grouts, and material specifications and installation instructions for liquid-applied waterproofing membrane.
- 1.4.2. **Samples:** Submit two samples of each tile type and color illustrating color range for selection. Submit two sets of samples of grout colors for selection.
- 1.4.3. **Maintenance Instructions:** Include recommended cleaning methods, cleaning materials, and stain removal methods.

#### 1.5. QUALITY ASSURANCE

- 1.5.1. Perform work in accordance with TCA *Handbook for Ceramic Tile Installation*, ANSI A108.5, and ANSI A108.10.

### PART 2 PRODUCTS

#### 2.1. TILE MATERIALS

##### 2.1.1. Tile Manufacturers:

##### 2.1.1.1. 2 x 2 Inch Mosaic Tile:

- 1) American Olean, Olean, NY 14760-0808; Style Ceramic Mosaic.
- 2) Dal-Tile, Dallas, TX 75217; Style Dal-Keystone Porcelain Ceramic Mosaics.
- 3) Summitville Tiles Inc., Summitville, OH 43962; Style Summitmates.

- 2.1.2. **Ceramic Mosaic Floor and Wall Tile and Wall Base:** ANSI A137.1; 4 ¼ x 4 ¼ and 2 x 2 x 1/4-inch size, square shape, matt surface finish, group 1 or 2 color as selected from ranges available.

- 2.1.3. **Ceramic Mosaic Tile Trim:** Match floor and wall tile for size, surface finish, color, and coved internal corner. Provide cove base, bullnose, and round-in and round-out corner tile trim at base, corners and edges.

#### 2.2. SETTING MATERIALS

- 2.2.1. **Thinset Mortar Materials:** ANSI A118.4, Latex-Modified; portland cement, latex additive, sand, and water.
- 2.2.2. **Organic Tile Adhesive:** ANSI A136.1; use for setting wall tile to gypsum board and elsewhere as required for setting tile as specified by ANSI A108.4 over substrates prepared accordingly; OmniGrip Maximum Strength Tile Adhesive (Type I) manufactured by Custom Building Products.
- 2.2.3. **Portland Cement Mortar (Use for Leveling Bed and Shower Pan Topping):** ANSI 108.1, mixture of portland cement and sand in proportions of 1 to 6, and water.

#### 2.3. GROUT MATERIALS

- 2.3.1. **Grout:** ANSI A118.6, ceramic tile grout.
- 2.3.2. **Color Admixture:** Integral pigment type, color as selected; Hydroment Ceramic Tile Grouts manufactured by Bostik Construction Products, Dallas, TX 75234;

S-710 Polychrome Designer Colors Sanded Joint Filler manufactured by Summitville Tiles Inc., Summitville, OH 43962; or Bonsal Standard Dense Grout Colors manufactured by W. R. Bonsal Company, Conley, GA 30027.

## 2.4. ACCESSORIES

- 2.4.1. Sealant: Mildew resistant type, and as specified in Section 07900.
- 2.4.2. Liquid-Applied Membrane Waterproofing: ANSI A118.10; use one of the following:
  - 2.4.2.1. RedGard Waterproofing and Crack Prevention Membrane manufactured by Custom Building Products, telephone 800-272-8786.
  - 2.4.2.2. Pro-Red Waterproof Membrane 963 manufactured by C-Cure, telephone 818-888-0050.
  - 2.4.2.3. LATAPOXY 24hr HydroProofing waterproofing membrane manufactured by Laticrete International, Inc., telephone 800-243-4788.
  - 2.4.2.4. AMV System 750 Waterproofing Membrane manufactured by AMV Industries, Inc., telephone 818-888-0050.
- 2.4.3. Accessories for Use with Liquid-Applied Membrane Waterproofing:
  - 2.4.3.1. Primer: Type recommended or provided by waterproofing material manufacturer.
  - 2.4.3.2. Patching Compound: Type recommended or provided by waterproofing material manufacturer.
  - 2.4.3.3. Fabric: Heavy duty, cross-stitched, polyester as recommended or provided by waterproofing material manufacturer.
  - 2.4.3.4. Sealant: Sika Flex 1A or type recommended by waterproofing material manufacturer.

## 2.5. MORTAR AND GROUT MIX

- 2.5.1. Mix and proportion pre-mix mortar and grout materials in accordance with manufacturer's instructions.

# PART 3 EXECUTION

## 3.1. EXAMINATION AND PREPARATION

- 3.1.1. Seal substrate surface cracks with filler.
- 3.1.2. Verify that gypsum board partitions and concrete masonry walls to receive wall tile and tile wall base are installed properly to receive the work of this Section.

## 3.2. INSTALLATION OF SHOWER PANS

- 3.2.1. Preparation and Protection:
  - 3.2.1.1. Clean substrate of materials, including curing compounds, form release agents and retarding agents, which would impair bond of membrane to

substrate. Patch cracks, voids, and spots, and grind smooth. Apply liquid membrane only after drains, drain piping, and other items have been installed.

- 3.2.1.2. Clean concrete substrate of dust, dirt, oil, grease and curing compounds. Ensure that concrete surface is smooth with a fine broom finish. Clean hairline cracks and rout out cracks larger than 1/16-inch wide. Seal cracks flush using a patching compound recommended by the liquid membrane manufacturer.
- 3.2.1.3. Ensure that concrete masonry surfaces have been sealed with an exterior type block filler as specified in Section 09900.
- 3.2.1.4. Immediately prior to application of membrane, clean surface to remove all residual dust.
- 3.2.1.5. Protect building from damage resulting from spillage, dripping and dropping of materials. Prevent materials from entering and clogging drains and water conductors. Repair and restore or replace other work that is spoiled or damaged in connection with performance of waterproofing work.

3.2.2. Installation of Waterproofing Membrane Shower Pan:

- 3.2.2.1. Install liquid-applied waterproofing membrane to form shower pans and wall waterproofing in accordance with ANSI A108.13 and manufacturer's written instructions. Arrange work so that the complete membrane in each separate location is applied in a continuous operation.
- 3.2.2.2. Install a strip of fabric not less than 6 inches wide embedded in liquid waterproofing material at shower floor slab perimeters and drains. Extend one half width of the strip up adjoining vertical surfaces and, when at a drop in the slab, out onto the higher slab elevation. Apply a second layer of fabric and liquid waterproofing at corners and areas subject to stress tucking the fabric tightly into corners and sealing with liquid waterproofing. Allow waterproofing to dry to the touch.
- 3.2.2.3. Precut the fabric providing an overlap of not less than 2 inches at seams and ends. Extend fabric up walls and coves. Apply a liberal coat of waterproofing, and remove all wrinkles. Apply a second coat of liquid waterproofing over the wet fabric and allow to dry. Apply a final coat of liquid waterproofing over the entire area and allow to cure.

3.2.3. Installation of Waterproofing Membrane on Shower Walls:

- 3.2.3.1. Repeat the above described procedure on the vertical walls surrounding the shower overlapping the dried waterproofing previously applied and turned up base of the walls. Extend waterproofing on concrete masonry shower wall to a height of not less than 84 inches above finish floor.

3.2. INSTALLATION OF TILE

- 3.2.1. Install tile, base, and grout in accordance with manufacturer's instructions and to TCA *Handbook for Ceramic Tile Installation* numbers as follows:

- 1) 2 x 2 Inch Mosaic Floor Tile: TCA No. F113-07.

- 2) 2 x 2 Inch Mosaic Wall Tile (concrete masonry substrate): TCA No. W202-07.
  - 3) 2 x 2 Inch Mosaic Wall Tile (gypsum board substrate): TCA No. W223-07 or W243-07.
  - 4) Tile Shower Receptors on Cement Mortar Bed: TCA No. B414-07.
  - 5) Tile Shower Wall on Concrete Masonry Substrate: Transition from TCA No. B414-07 on floor to TCA No 202-07 on walls with flush coved tile base.
- 3.2.2. Provide portland cement mortar leveling bed where required to receive thinset tile. After application of shower pan waterproofing, apply portland cement mortar bed flush and level of concrete floor slab external to shower and slope mortar bed to drain at a slope of 1/4 inch per foot.
- 3.2.3. Set tile to pattern selected.
- 3.2.4. Cut and fit tile tight to penetrations. Form corners and bases neatly. Align floor, base, and wall base joints.
- 3.2.5. At door sills where a transition occurs in flooring type, terminate ceramic tile with bullnose trim with edge centered below the door and butt resilient floor tile into edge of bullnose.
- 3.2.5. Align joints in floor tile, tile base and wall tile. Terminate ceramic tile with bullnose trim where tile is discontinued on a wall surface.
- 3.2.6. Grout tile joints. Make joints watertight, without voids, cracks, excess mortar or excess grout.
- 3.2.7. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

**END OF SECTION**

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## SECTION 09511

### SUSPENDED ACOUSTICAL CEILINGS

#### PART 1 GENERAL

##### 1.1. SECTION INCLUDES

- 1.1.1. Suspended metal grid ceiling system.
- 1.1.2. Acoustical panels.

##### 1.2. SYSTEM DESCRIPTION

- 1.2.1. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.

#### PART 2 PRODUCTS

##### 2.1. SUSPENSION SYSTEM

- 2.1.1. Manufacturer: USG Interiors, Inc.; Style, Donn DXLA.
- 2.1.2. Grid: ASTM C635, intermediate, non-fire rated, exposed "T" configuration; components die cut and interlocking, and with aluminum cap.
- 2.1.3. Accessories: Stabilizer bars, clips, splices, edge moldings, and hold down clips required for suspended grid system.
- 2.1.4. Grid Materials: Commercial quality cold-rolled steel with galvanized coating.
- 2.1.5. Grid Finish: Surfaces exposed to view, aluminum with factory-applied white baked enamel finish.
- 2.1.6. Support Channels and Hangers: Galvanized steel, size and type to suit application. Use minimum No. 10 gage hanger wire, soft annealed, zinc-coated finish.

##### 2.2. ACOUSTICAL UNITS

- 2.2.1. Manufacturers: Armstrong World Industries, Inc.; Cortega square lay-in panels.
- 2.2.2. Acoustical Panels, Regular: Wet-formed mineral fiber panels conforming to the following:
  - 1) Size: 24 x 48 inches.
  - 2) Thickness: 5/8 inches minimum.
  - 3) Surface Finish: Fissured.
  - 4) Edge: Square.

## **PART 3 EXECUTION**

### **3.1. EXAMINATION AND COORDINATION**

- 3.1.1. Verify that layout of hangers will not interfere with other work.
- 3.1.2. Coordinate with gypsum board assembly, air ducts, diffusers and grilles, and lighting fixture work specified in Sections 09260, 15710, and 16500, respectively.

### **3.2. INSTALLATION - SUSPENSION SYSTEM**

- 3.2.1. Install system in accordance with ASTM C636 and manufacturer's instructions.
- 3.2.2. Coordinate the location of hangers with other work. Where components prevent the regular spacing of hangers, reinforce the system to span the extra distance. Space hangers not to exceed 48 inch centers in both directions.
- 3.2.3. Hang system independent of walls, columns, ducts, pipes and conduit.
- 3.2.4. Locate system on room axis according to reflected ceiling plans on the Drawings.
- 3.2.5. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths.

### **3.3. INSTALLATION - ACOUSTICAL UNITS**

- 3.3.1. Install acoustical units level, free from damage, twist, warp or dents.
- 3.3.2. Lay directional patterned units one way with pattern as indicated on the Drawings.
- 3.3.3. Install hold down clips to retain panels tight to grid system within 12 ft of an exterior door.

### **3.4. TOLERANCES**

- 3.4.1. Variation from Flat and Level Surface: 1/8 inch in 10 feet.

**END OF SECTION**

## SECTION 09900

### PAINTS AND COATINGS

#### PART 1 GENERAL

##### 1.1. SECTION INCLUDES

- 1.1.1. Surface preparation and field application of texture, paints and coatings.

##### 1.2. RELATED SECTIONS

- 1.2.1. Section 04815 - Single-Wythe Unit Masonry: Interior exposed surfaces of concrete masonry walls requiring painting work of this Section.
- 1.2.2. Section 05120 – Structural Steel: Steel joists requiring painting work of this Section.
- 1.2.3. Section 05500 - Metal Fabrications: Shop-finished ferrous metal requiring painting work of this Section.
- 1.2.4. Section 08110 - Standard Steel Doors and Frames: Primed steel doors and frames requiring painting work of this Section.
- 1.2.5. Section 08310 - Access Doors and Frames: Primed steel access doors and frames requiring painting work of this Section.
- 1.2.6. Section 08333 - Overhead Coiling Doors: Primed steel coiling doors requiring painting work of this Section.
- 1.2.7. Section 09260 – Gypsum Board Assemblies: Gypsum board surfaces requiring painting work of this Section.

##### 1.3. SUBMITTALS

- 1.3.1. Section 01001 – Basic Requirements: Submittal procedures.
- 1.3.2. Product Data: Provide data including Material Safety Data Sheets and manufacturer's application instructions, on all finishing products.
- 1.3.3. Samples: Submit two sets of samples illustrating range of colors available for each surface finishing product scheduled.

##### 1.4. QUALIFICATIONS

- 1.4.1. Manufacturer: Company specializing in manufacturing the Products specified in this Section with minimum of five years experience.
- 1.4.2. Applicator: Company specializing in performing the work of this Section with minimum of five years experience.

##### 1.5. DELIVERY, STORAGE, AND HANDLING

- 1.5.1. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

- 1.5.2. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation requirements, drying time, cleaning requirements, color designation, and instructions for mixing and reducing.
- 1.5.3. Store paint materials at minimum ambient temperature of 45 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

#### 1.6. ENVIRONMENTAL REQUIREMENTS

- 1.6.1. Apply materials in environmental conditions required by manufacturer's instructions. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- 1.6.2. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- 1.6.3. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

### PART 2 PRODUCTS

#### 2.1. MATERIALS

- 2.1.1. Manufacturer: Paint type and quality are based on the products of:
  - 1) Devoe & Raynolds Company, Louisville, KY 40207, unless otherwise specified.
- 2.1.2. Other Acceptable Manufacturers: Equivalent products of the following:
  - 1) Pittsburgh Paints.
  - 2) The Sherwin-Williams Company
- 2.1.3. Coatings: Ready-mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags.
- 2.1.4. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, and of commercial quality.

#### 2.2. FINISHES

- 2.2.1. Refer to schedule at end of section for surface finish schedule. to receive paint coating.

### PART 3 EXECUTION

#### 3.1. EXAMINATION

- 3.1.1. Verify that substrate conditions and surfaces are ready to receive work as instructed by the product manufacturer.

- 3.1.2. Examine surfaces scheduled to be finished prior to commencement of work. Report conditions that may potentially affect proper application.
- 3.1.3. Test shop-applied primer for compatibility with subsequent cover materials.
- 3.1.4. Measure moisture content of porous surfaces using an electronic moisture meter. Do not apply finishes unless moisture content is less than 12 percent for concrete unit masonry.

### 3.2. PREPARATION

- 3.2.1. Correct defects and clean surfaces which affect work of this Section.
- 3.2.2. Remove hardware, fittings, and other surface-mounted items prior to preparing surfaces or finishing.
- 3.2.3. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- 3.2.4. Uncoated Ferrous Metal Surfaces: Remove scale by wire brushing, sandblasting, clean by washing with solvent. Apply treatment of phosphoric acid solution ensuring that weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.
- 3.2.5. Shop-Primed Steel Surfaces: Sand and scrape to remove loose primer and rust, power tool clean, clean surfaces with solvent. Prime bare steel surfaces.
- 3.2.6. Steel Doors: Seal top and bottom edges with primer and paint.

### 3.3. APPLICATION

- 3.3.1. General: Apply products in accordance with manufacturer's instructions.
- 3.3.2. Do not apply finishes to surfaces that are not dry.
- 3.3.3. Apply each coat to uniform finish.
- 3.3.4. Apply each coat of paint slightly darker than preceding coat, unless otherwise approved.
- 3.3.5. Sand finishes, other than textured coatings and concrete masonry, lightly between coats to achieve required finish.
- 3.3.6. Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.
- 3.3.7. Allow applied coat to dry before next coat is applied.

### 3.4. FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

- 3.4.1. None required in this Contract, except that finishes of mechanical and electrical equipment installed as part of the Work of this Contract shall have finishes repaired when damaged during the performance of the Work.

### 3.5. CLEANING

- 3.5.1. As work proceeds, promptly remove finishes where spilled, splashed, or spattered.

- 3.5.2. Collect waste material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

### 3.6. SCHEDULE OF SHOP-FINISHED ITEMS FOR SITE FINISHING

- 3.6.1. Metal Fabrications (Section 05500): Exposed surfaces of ferrous metal cable/conduit entrance.
- 3.6.2. Steel Doors and Frames (Sections 08110, 08310 and 08333): Re-prime coating of all surfaces and painting of exposed surfaces of doors and door frames.
- 3.6.3. Galvanized Surfaces: Repair and touch-up of galvanized surfaces is specified in Section 05500.

### 3.7. PAINTING SCHEDULE

- 3.7.1. Provide the paint finishes scheduled as follows. Where minimum coverage or wet film thickness (MWF) is not specified, conform to manufacturer's instructions for exposure and condition of use.

#### 3.7.2. Schedule - Exterior Surfaces:

- 3.7.2.1. Steel - Shop Primed or Galvanized, Exterior: Use for exposed surfaces of steel doors and frames and other exposed shop-primed and galvanized steel.

- 1) Solvent clean shop primed and galvanized surfaces; one coat of etching primer to galvanized surfaces.
- 2) One coat of epoxy ester metal primer; Devoe Mirrolac Cover Up Rust Penetrating Metal Primer No. 13101 (MWF 4.0 mils, MDF 2.0 mils), 379 sq ft of coverage per gallon.
- 3) Two coats of alkyd enamel, semi-gloss; Devoe Triple Cover Exterior Alkyd Semi-Gloss No. 502XX (MWF 3.5 mils, MDF 2.2 mils), 400 sq ft of coverage per gallon.

- 3.7.2.2. Concrete Masonry, Exterior: Water repellent penetrant is specified in Section 07190.

#### 3.7.3. Schedule - Interior Surfaces:

##### 3.7.3.1. Steel – Unprimed, Interior:

- 1) One coat of alkyd primer sealer; Devoe Velour Alkyd Enamel Undercoat No. 8801 (MWF 4.0 mils, MDF 2.0 mils), 400 to 500 sq ft of coverage per gallon.
- 2) Two coats of alkyd enamel, eggshell; Devoe Velour Alkyd Eggshell Enamel No. 23XX (MWF 3.5 mils, MDF 1.7 mils), 500 sq ft of coverage per gallon.

##### 3.7.3.2. Steel – Primed, Interior:

- 1) One coat of epoxy ester metal primer; Devoe Mirrolac Cover Up Rust Penetrating Metal Primer No. 13101 (MWF 4.0 mils, MDF 2.0 mils), 379 sq ft of coverage per gallon.
- 2) Two coats of alkyd enamel, semi-gloss; Devoe Triple Cover Exterior Alkyd Semi-Gloss No. 502XX (MWF 3.5 mils, MDF 2.2 mils), 400 sq ft of coverage per gallon.

3.7.3.5. Concrete Masonry, Interior:

- 1) Fill with block filler: Devoe BLOXFIL No. 52901.
- 2) Two coats of interior/exterior acrylic latex semi-gloss coating; Devoe Metalclad Interior/Exterior Acrylic Latex Semi-Gloss Coating No. 417XX (MWF 4.5 mils, MDF 1.5 mils), 364 sq ft of coverage per gallon.

3.7.3.6. Concrete Masonry, Interior (use in Toilets in Maintenance Building):

- 1) Fill with block filler: Devoe Wonder-Pruf No.11501.
- 2) Two coats of water-based epoxy semi-gloss coating; Devoe Tru-Glaze-4 Water-Based Epoxy Semi-Gloss Coating No. 128XX (MWF 6.0 mils, MDF 3.0).

3.7.3.7. Gypsum Board Drywall:

- 1) Prime with vinyl latex primer, Devoe No. 50801.
- 2) Two coats of interior acrylic latex eggshell enamel; Devoe Wonder-Tones Interior Acrylic Latex Eggshell Enamel No. 34XX (MWF 4.0 mils, MDF 1.4 mils), 400 sq ft of coverage per gallon.

3.7.3.8. Wood (Use for Plywood Decks in Maintenance Building and other wood):

- 1) Prime with enamel undercoat, Devoe No. 51701.
- 2) Two coats of acrylic latex satin enamel; Devoe Porch & Floor Acrylic Latex Satin Enamel No. 78XX (MWF 4.5 mils, MDF 1.4 mils), 400 sq ft of coverage per gallon.

3.8. SCHEDULE - COLORS

- 3.8.1. A color schedule will be provided by the Engineer/Architect using a maximum of two colors for each type of finish coating from product manufacturer's standard color line.

**END OF SECTION**

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**SECTION 10170**  
**PLASTIC TOILET COMPARTMENTS**

**PART 1 GENERAL**

**1.1. SUMMARY**

1.1.1. Section includes solid plastic toilet compartments and urinal screens.

**1.2. SUBMITTALS**

1.2.1. Shop Drawings: Indicate partition plan and elevation views, dimensions, details of wall and floor supports, and door swings.

1.2.2. Samples: Submit two samples in manufacturer's standard sample size illustrating panel finish, color, and sheen.

**PART 2 PRODUCTS**

**2.1. TOILET COMPARTMENTS**

**2.1.1. Manufacturers:**

- 1) Accurate Partitions Corp.; Model Accurate Solid Plastic, Floor Anchored / Overhead Braced.
- 2) Bradley; Model Bradmar Series 400, Sentinel Overhead Braced.
- 3) COMTEC/Capitol; Series S200 Solid Plastic, Floor-Mounted Overhead Braced.
- 4) General Partitions; Series 40 H.D.P., Floor Supported with Headrail.
- 5) Global Steel Products Corp.; Model Global Polymer, Floor Anchored / Overhead Braced..
- 6) Hadrian, Inc.; Solid Plastic, Headrail Braced.
- 7) Metpar Corp.; Solid Plastic SPR Polly, Corinthian Overhead Braced.
- 8) Rockville Partition, Inc.; Solid Polymer OH Series.

**2.2. COMPONENTS**

2.2.1. Door, Panel, Pilaster, and Urinal Screen Construction: Solid plastic of high density polyethylene resins with homogeneous color throughout and smooth, machined edges, one inch (25 mm) thick.

**2.3. ACCESSORIES**

2.3.1. Head Rails: Hollow chrome-plated steel, aluminum, or stainless steel tube, with cast socket wall brackets.

2.3.2. Pilaster Shoes: Formed chrome-plated steel or stainless steel. Provide adjustment for height variations with screw jack through steel saddles.

2.3.3. Internal reinforcement: Provide for attached hardware and fittings.

2.3.4. Attachments and Bolts: Steel, with heavy duty aluminum brackets.

2.3.5. Hardware:

2.3.5.1. Hinges: Pivot hinges, gravity type, adjustable; two for each door.

2.3.5.2. Latch and Keeper: Sliding type latch, door strike and keeper with rubber bumper; for each door.

2.3.5.3. Coat Hook: Cast alloy, with rubber bumper tip; mounted as directed by Engineer/Architect.

**PART 3 EXECUTION**

3.1. EXAMINATION

3.1.1. Verify opening dimensions and plumbing fixture and rough-in locations are as indicated on shop drawings or instructed by manufacturer.

3.1.2. Verify correct location of built-in framing, anchorage, bracing, and blocking.

3.2. INSTALLATION

3.2.1. Install partition components and urinal screen secure, plumb, and level.

3.2.2. Attached panel brackets securely using anchor devices.

3.2.3. Adjust and align door hardware so free movement is attained.

**END OF SECTION**

## SECTION 10440

### SIGNS

#### PART 1 GENERAL

##### 1.1. SECTION INCLUDES

- 1.1.1. Raised letter plastic signs.
- 1.1.2. Signs of silk screened characters on aluminum sheet.

##### 1.2. RELATED SECTIONS

- 1.2.1. Section 05500 – Metal Fabrications: Pipe post to which accessible parking sign is to be attached.

##### 1.3. SUBMITTALS

- 1.3.1. Manufacturer's Product Data: Submit data on raised letter room signs illustrating type, style, letter font, and colors specified; method of attachment. When colors are not specified, provide color samples for Architect's selection
- 1.3.2. Manufacturer's Installation Instructions: Include installation template and attachment devices.

##### 1.4. QUALIFICATIONS

- 1.3.1. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years experience.

##### 1.4. REGULATORY REQUIREMENTS

- 1.4.1. Conform to Americans with Disability Act (ADA), Texas Accessibility Standards (TAS) of the Architectural Barriers Act - Article 9102 of Texas Civil Statutes, and ANSI A117.1 for requirements for the physically handicapped.

##### 1.5. DELIVERY, STORAGE, AND HANDLING

- 1.5.1. Deliver, store, protect and handle products to site under provisions of the Contract.
- 1.6.2. Package signs, labeled in name groups.
- 1.5.3. Store adhesive attachment tape at ambient room temperatures.

##### 1.7. ENVIRONMENTAL REQUIREMENTS

- 1.7.1. Do not install signs when ambient temperature is lower than recommended by manufacturer.
- 1.7.2. Maintain this minimum temperature during and after installation of signs.

#### PART 2 PRODUCTS

- 2.1. Corpus Christi Stamp Works (CCSW), Corpus Christi, TX 78401, 512/884-4801.

2.1.2. Substitutions: Comply with the requirements of the provisions of the Contract. Others manufacturers are acceptable when their equivalent products comply with the requirements of this Section. Other manufacturers include the following:

- 1) Andco Industries Corporation
- 2) Best Manufacturing Sign Systems
- 3) Scott Signs Systems, Inc.
- 4) SCS Co-Sines
- 5) Supersine Company

## 2.2. RAISED LETTER SIGNS

2.2.1. Style: CCSW VisiTouch Accent Series with raised characters and braille translations.

2.2.2. Base Material: Solid color acrylic plastic:

- 1) Total Thickness: 1/8 inch (3 mm).
- 2) Height: 8 inches (203 mm).
- 3) Width: 8 inches (203 mm).
- 4) Edges: Radiused.
- 5) Colors: Refer to Schedule below or as selected by Architect.

2.2.3. Raised Character Size and Style:

- 1) Material: Acrylic plastic, character adhered to base material:
- 2) Character Color: As selected by Architect.
- 3) Character Thickness: 1/32 inch (0.80 mm) raised from surface.
- 4) Character Height: 3/4 inch (19 mm).
- 5) Character Font: Helvetica.
- 6) Character Case: Upper case, unless otherwise specified.

2.2.4. Graphics:

- 1) Material: Acrylic plastic, graphic adhered to base material:
- 2) Graphic Thickness: 1/32 inch (0.80 mm) raised from surface.
- 3) Graphic Style: Handicapped type.

2.2.5. Braille: Grade 2 routed from laminate surface.

## 2.3. SILK SCREENED SIGNS

2.3.1. Sign: Letters one inch (25 mm) high silk screened onto fibrous-glass-reinforced plastic resin sheet surface:

- 1) Sign Color: As selected by Architect.
- 3) Character Color: As selected by Architect.
- 4) Total Thickness: 1/16 inch (1.5 mm) minimum.
- 5) Sign Size: Refer to Sign Schedule on Drawings. 14 inches (356 mm) wide x 10 inches (254 mm) high.
- 6) Edges: Radiused.
- 7) Character Font: Helvetica, upper case.
- 8) Provide corner holes for attachment.

2.3.2. Attachment: Fasten "accessible parking only" and "van accessible" sign to pipe post where scheduled and indicated using self-tapping screws.

## 2.4. ACCESSORIES

- 2.4.1. Tape Adhesive: Double-sided tape, permanent adhesive.

## **PART 3 EXECUTION**

### 3.1. EXAMINATION

- 3.1.1. Verify that substrate surfaces are ready to receive work.

### 3.2. INSTALLATION

- 3.2.1. Install in accordance with manufacturer's instructions.
- 3.2.2. Install signs after surfaces are finished, in locations as directed or scheduled.
- 3.2.3. Locate room sign level on wall surface on the hinge side of door 60 inches (1524 mm) above finish floor to centerline of sign. Locate sign so that space between door frame and closest edge of sign is between 1 and 8 inches (25 and 200 mm).
- 3.2.4. Locate "accessible parking and van accessible" sign on pipe post in front of the designated accessible parking spaces. Mount signs to steel pipe post using self-tapping screws. Mount sign with bottom edge of lower sign at 60 inches above pavement.

### 3.3. SCHEDULES

- 3.3.1. Raised Letter Room Signs: Individual Helvetica letters, 3/4 inch high, black color. Coordinate room names and numbers with Architect:
- 3.3.2. Toilet Room Door Graphics: 8-inch by 8-inch size, blue face color, international symbol of accessibility graphic image, text "WOMEN" on one sign and "MEN" on the other, and in braille on each, respectively; white text and symbol color.
- 3.3.3. Accessible Parking Signs: For each accessible parking space indicated on the Drawings, provide one set of each of the two signs specified above in paragraph 2.3.1. and install as specified in paragraph 3.2.4. above.

**END OF SECTION**

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## SECTION 10523

### FIRE EXTINGUISHER CABINET

#### PART 1 GENERAL

##### 1.1. SECTION INCLUDES

- 1.1.1. Fire extinguisher cabinet. The Owner will provide portable fire extinguishers.

##### 1.2. SUBMITTALS

- 1.2.1. Product Data: Submit the following:

- 1.2.1.1. Materials list of items proposed to be provided under this Section.
- 1.2.1.2. Manufacturer's specifications, catalog cuts, and other data needed to demonstrate compliance with the specified requirements.
- 1.2.1.3. Manufacturer's installation instructions which, when accepted by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

#### PART 2 PRODUCTS

##### 2.1. FIRE EXTINGUISHER CABINETS

- 2.1.1. Manufacturer: Larsen's Manufacturing Company, Minneapolis, MN 55432, Telephone 800-527-7367.
- 2.1.2. Model: Architectural Series 2409-6R, Full Glass Design, clear laminated safety glass, with Bracket No. 862, rolled-edge semi-recessed style with 2-1/2-inch projection; inside box dimensions of 9-1/2 inches wide x 24 inches high x 6 inches deep sized to hold a 10-lb capacity portable fire extinguisher. Owner will provide portable fire extinguisher.
- 2.1.3. Fire Rating: Provide fire-rated cabinets located in fire-rated partitions.
- 2.1.4. Finish: White baked enamel finish on steel box and clear anodized aluminum finish on door and trim.

#### PART 3 EXECUTION

##### 3.1. SURFACE CONDITIONS

- 3.1.1. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

##### 3.2. INSTALLATION

- 3.2.1. Install the work of this Section in strict accordance with the manufacturer's instructions anchoring all components firmly into position for long life under hard use in locations indicated on the Drawings.

- 3.2.2. Install cabinets recessed at with a height above finish floor to comply with applicable standards or requirements of the Owner.
- 3.2.3. Install fire-rated cabinets In fire-rated partitions.
- 3.2.4. Remove and replace damaged, defective cabinets, if any.

**END OF SECTION**

## SECTION 10800

### TOILET AND BATH ACCESSORIES

#### PART 1 GENERAL

##### 1.1. SECTION INCLUDES

- 1.1.1. Toilet and bath accessories.
- 1.1.2. Grab bars.

##### 1.2. RELATED WORK

- 1.2.1. Sections 04815 – Single Wythe Unit Masonry: Concrete masonry walls to receive the work of this Section.
- 1.2.2. Sections 06114 – Miscellaneous Rough Carpentry: Placement of concealed blocking.
- 1.2.3. Sections 09260 - Gypsum Board Assemblies: Metal drywall framing and gypsum board finish.

##### 1.3. SYSTEM DESCRIPTION

- 1.3.1. Conform to applicable code for installing work in conformance with ANSI A117.1, the Americans with Disabilities Act, and Texas Accessibility Standards.

##### 1.4. SUBMITTALS

- 1.4.1. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.
- 1.4.2. Supply to Owner two keys for each keyed accessory.

#### PART 2 PRODUCTS

##### 2.1. MATERIALS

###### 2.1.1. Manufacturers:

###### 2.1.1.1. Scheduled Products are manufactured by:

Bobrick Washroom Equipment, Inc., Jackson, TN 38301.

###### 2.1.1.2. Other Acceptable Manufacturers:

- 1) A&J Washroom Accessories Inc., New Windsor, NY 12553-0569.
- 2) American Specialties, Inc., Yonkers, NY 10701-9986.
- 3) Bradley Corporation, Menomonee Falls, WI 53052-0309.
- 4) General Accessory Manufacturing Co., Durant, OK 74701.
- 5) McKinney/Parker, Dallas, TX 75228-2410.

###### 2.1.2. Sheet Steel: ASTM A366.

###### 2.1.3. Stainless Steel Sheet: ASTM A167, Type 304.

- 2.1.4. Tubing: ASTM A269, stainless steel.
- 2.1.5. Mirror Glass : Clear tempered safety type with copper and silver coating, organic overcoating, square edges, 6 mm thick minimum, and of size required for scheduled frame.
- 2.1.6. Concealed Fasteners: Hot dip galvanized steel.
- 2.1.7. Exposed Fasteners: Stainless steel or chrome-plated steel or brass.

## 2.2. FABRICATION

- 2.2.1. Form surfaces flat without distortion. Weld and grind joints smooth.
- 2.2.2. Shop assemble components and package with anchors and fittings.
- 2.2.3. Back paint components to prevent electrolysis.
- 2.2.4. Provide steel anchor plates, adapters, and anchor components for installation.
- 2.2.5. Hot dip galvanize exposed and painted ferrous metal and concealed fastening devices.

## 2.3. FINISHES

- 2.3.1. Anchors: Galvanize to 1.25 oz/sq ft.
- 2.3.2. Ferrous Metals, Shop-Primed: Pretreat and clean, spray apply one coat primer and bake.
- 2.3.3. Chrome/Nickel Plating: ASTM B456, Type SC 2; satin finish.
- 2.3.4. Stainless Steel: No. 4 satin luster finish.

## PART 3 EXECUTION

### 3.1. EXAMINATION AND PREPARATION

- 3.1.1. Verify exact location of accessories for installation.
- 3.1.2. Deliver inserts and rough-in frames to site. Provide templates and rough-in measurements as required.

### 3.2. INSTALLATION

- 3.2.1. Install fixtures, accessories and items in accordance with manufacturers' instructions in locations and at heights as indicated on Drawings and in compliance with Texas Accessibility Standards.
- 3.2.2. Install plumb and level, securely and rigidly anchored to substrate.

### 3.3. SCHEDULE

<u>Item</u>	<u>Model No.</u>	<u>Finish</u>	<u>Location</u>
Toilet Tissue Dispenser, Surface-Mounted	B-2740	Cast Aluminum	One per water closet
Framed Mirror with Shelf, Surface-Mounted	B-166-2436	Stainless Steel	One per lavatory
Surface-Mounted Paper Towel Dispenser	B-262	Stainless Steel	One per lavatory
Sanitary Napkin Disposal, Surface-Mounted, with Disposable Liners	B-270 270-12	Stainless Steel	One in Women's water closet
Soap Dispenser, Surface-Mounted	B-4112	Stainless Steel	One per lavatory
Grab Bars, 1-1/4 inch diameter	B-5806	Stainless Steel	One 36" long at rear of each water closet & one 42" long at side of each water closet
Coat Hook	B-771	Stainless Steel	One at 48" AFF on water Closet side of each toilet compartment door. And one at 48" AFF and one at 72" AFF adjacent to each shower as located by Eng/Architect.
Piping Protection Kit	Tru-Bro Inc. Model Lav-Guard 2	White plastic	One set at each lavatory

**END OF SECTION**

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7/15/2013

**DIVISION 15 – MECHANICAL**

- 15010 SUMMARY OF MECHANICAL WORK
- 15050 BASIC MECHANICAL MATERIALS AND METHODS
- 15060 HANGERS AND SUPPORTS
- 15070 SUPPORTS AND ANCHORS
- 15075 MECHANICAL IDENTIFICATION
- 15081 DUCT INSULATION
- 15083 PIPE INSULATION
- 15110 VALVES
- 15140 DOMESTIC WATER PIPING
- 15150 SANITARY WASTE AND VENT PIPING
- 15190 SYSTEM IDENTIFICATION AND PIPE MARKING
- 15410 PLUMBING FIXTURES
- 15415 DRINKING FOUNTAINS AND WATER COOLERS
- 15430 PLUMBING SPECIALTIES
- 15781 ROOFTOP HEATING AND COOLING UNITS
- 15815 METAL DUCTS
- 15820 DUCT ACCESSORIES
- 15837 CENTRIFUGAL FANS
- 15855 DIFFUSERS, REGISTERS, AND GRILLES
- 15990 TESTING, ADJUSTING, AND BALANCING



**DIVISION 16 – ELECTRICAL**

- 16010 SUMMARY OF ELECTRICAL WORK
- 16020 BASIC ELECTRICAL REQUIREMENTS
- 16050 BASIC ELECTRICAL MATERIALS AND METHODS
- 16055 SITE ELECTRICAL
- 16060 GROUNDING AND BONDING
- 16075 ELECTRICAL IDENTIFICATION
- 16120 BUILDING WIRE AND CABLE
- 16130 RACEWAYS AND BOXES
- 16140 WIRING DEVICES
- 16190 SUPPORTING DEVICES
- 16440 DISCONNECT SWITCHES
- 16442 PANELBOARDS
- 16475 FUSES
- 16511 INTERIOR LIGHTING
- 16521 EXTERIOR LIGHTING
- 16721 FIRE ALARM / LIFE SAFETY SYSTEMS
- 16741 TELEPHONE AND DATA COMMUNICATIONS
- 16900 EQUIPMENT CONNECTIONS AND CONTROL WIRING

**SECTION 15010  
SUMMARY OF MECHANICAL WORK**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and other Division 15 Specification Sections, apply to this Section.

**1.2 WORK COVERED BY CONTRACT DOCUMENTS**

- A. The following Summary of Work is intended as an aid to achieve an understanding of the various elements of work included in the project, as is not intended to be all-inclusive. Detailed descriptions of work and requirements are given in drawings and specifications.

- B. Mechanical Contract Documents were prepared for the Project by:

Trinity MEP Engineering, LLC  
3533 Moreland Dr. Ste. A  
Weslaco, Texas 78596  
Phone Number: (956) 973-0500  
Contact Person: Leonardo Munoz, P.E.

- C. General Scope of Work:

1. Install AC equipment and ductwork as shown on the contract documents. Refer to drawings for schedule of equipment that will be installed. After installing equipment, connect power to unit.
2. HVAC: Provide all materials and labor associated with a complete operational installation of new HVAC systems including, but not limited to:
  - DX Roof Top Units
  - Exhaust fans
  - Sheet metal, Ductwork
  - Diffusers and Grilles
  - Duct accessories, including grilles, and louvers
  - Air Test and Balance
3. Plumbing: Provide all materials and labor associated with a complete operational installation of new Plumbing systems including, but not limited to:
  - Plumbing Fixtures for facility
  - Piping for Sanitary Sewer and Vent Systems
  - Piping for Domestic water and Hot Water Systems.

**1.3 CONTINGENCY**

1. Refer to architectural specifications for Mechanical Contingencies.

**1.4 COORDINATION**

- A. All mechanical work shall be done under sub-contract to a General Contractor. Mechanical Contractor shall coordinate all work through General Contractor, even in areas where only mechanical work is to take place.

- B. Coordination between all trades shall take place on a regular basis to avoid conflicts between disciplines and equipment clearances.
- C. Work shall take place with minimal disruption to Owner's operations in areas surrounding the new building.
- D. Cooperate fully with other contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.
- E. Fully coordinate with electrical contractor for providing power to mechanical equipment.
- F. Mechanical Contractor is responsible for all control wiring including thermostat(s). This includes all conduit, wire, and accessories both low voltage and source voltage for the controls' system. Mechanical Contractor will provide all the necessary actuators, relays, software, hardware, and all necessary accessories required for a fully functional controls' system.

## **1.5 UTILITIES**

- 1. Coordinate with power, water, telephone, cable and gas utilities to locate all utilities prior to digging in any area.
- 2. Obtain any approvals required from utilities to relocate utilities.
- 3. Cost of relocating or bypassing utilities indicated on drawings shall be included in Base Bid.

## **1.6 CONTRACTOR USE OF PREMISES**

- A. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.
  - 1. Owner Occupancy: Allow for Owner occupancy and use by the public.
  - 2. Driveways and Entrances: Keep driveways and entrances serving the premises, clear and available to the Owner, the Owner's employees, and emergency vehicles at all time. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- B. Site Safety: Take every precaution to ensure the site does not present a threat to the safety of occupants and/or workers. Minimal safety requirements include, but are not limited to the following:
  - 1. Temporary fencing around construction areas.
  - 2. Yellow caution tape and construction barricades along open trenches during the day. Trenches shall be covered at night and warning lights provided on construction barricades.
  - 3. Temporary fencing around equipment while site work is in progress.

## **1.7 SUBMITTALS**

- 1. To expedite the submittal process more efficiently, DO NOT piece-meal the submittals. Submit entire mechanical or plumbing in a bound enclosure. This will eliminate delays in the submittal process.

## **1.8 CONTINGENCY FUND**

Refer to architectural specifications for all project contingencies.

**END OF SECTION**

**SECTION 15050**  
**BASIC MECHANICAL MATERIALS AND METHODS**

**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 basic mechanical materials and methods to complement other Division 15 Sections.
  - 1. Piping materials and installation instructions common to most piping systems.
  - 2. Concrete base construction requirements.
  - 3. Escutcheons.
  - 4. Dielectric fittings.
  - 5. Flexible connectors.
  - 6. Mechanical sleeve seals.
  - 7. Equipment nameplate data requirements.
  - 8. Nonshrink grout for equipment installations.
  - 9. Field-fabricated metal and wood equipment supports.
  - 10. Installation requirements common to equipment specification sections.
  - 11. Cutting and patching.
  - 12. Touchup painting and finishing.

**1.3 DEFINITIONS**

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
  - 1. PVC: Polyvinyl chloride plastic.
- G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene propylene diene terpolymer rubber.

#### **1.4 SUBMITTALS**

- A. Product Data: For dielectric fittings, flexible connectors, mechanical sleeve seals, and identification materials and devices.
- B. Coordination Drawings: Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:
  1. Planned piping layout, including valve and specialty locations and valve-stem movement.
  2. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
  3. Sizes and location of required concrete pads and bases.
  4. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
  5. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.

#### **1.5 QUALITY ASSURANCE**

- A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
- B. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

#### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.
- B. Protect stored pipes, ductwork, equipment, and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.
- C. Protect flanges, fittings, and piping specialties from moisture and dirt.
- D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

#### **1.7 SEQUENCING AND SCHEDULING**

- A. Coordinate mechanical equipment installation with other building components.

- B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
- C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.
- D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.
- E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- F. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Division 8.
- G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

#### **1.8 OPERATION PRIOR TO ACCEPTANCE**

- A. When any equipment is operable, and it is to the advantage of the Contractor to operate the equipment, he may do so provided that he properly supervises the operation, and retains full responsibility for the equipment operated.
- B. Regardless of whether or not the equipment has or has not been operated, the Contractor shall clean the equipment properly, make required adjustments, and complete punch list items before final acceptance by the Owner.
- C. The date of acceptance by the Engineer, for beneficial use by the Owner, shall be the beginning date of the warranty period.

#### **1.9 SPACE AND EQUIPMENT ARRANGEMENT**

- A. The size of each item of mechanical equipment shown on the Drawings is based on the dimensions of a particular manufacturer as indicated. While other manufacturers may be acceptable, it shall be the responsibility of the Contractor to determine whether or not the equipment he proposes to furnish will fit into the space. Shop drawings shall be prepared when required by the engineer to indicate a suitable arrangement.
- B. Install equipment in a manner to permit access to all surfaces. Install valves, motors, drives, lubricating devices, filters, and other accessory items in a position to allow removal for service without requiring the disassembly of another part.
- C. Provide access panels acceptable to the Engineer for equipment that is concealed above ceiling space.
- D. Large equipment assemblies or components which will be installed in the building, and which are too large to permit access through doorways, stairways or shafts, shall be brought to the site and placed in the appropriate spaces before the enclosing structure is completed. Provisions shall be implemented by the Contractor to insure that the equipment will not be damaged in any way during the associated construction procedures.

### **1.10 START-UP OF EQUIPMENT AND SYSTEMS**

- A. Whenever the manufacturer of a particular item of equipment or a particular system makes available a start-up service after completion of the installation, such manufacturer's start-up service (rendered by the manufacturer or his authorized representative) shall be provided.
- B. Witnessing and explanations of start-up services shall be included as part of the "Instruction of Owner's Personnel" as specified below.

### **1.11 INSTRUCTION OF OWNER'S PERSONNEL**

- A. Provide the services of competent engineers or technicians acceptable to the Engineer to instruct representatives of the Owner in complete and detailed operation and maintenance of each item of equipment, and each system. These instructions shall be provided for whatever periods may be necessary to accomplish the desired results. Upon completion of these instructions, the Contractor shall obtain a letter of release, acknowledged by the Owner or his authorized representative, stating the dates on which the various kinds of instruction were given, and the personnel to whom the instructions were given.
- B. The Contractor shall be fully responsible for proper maintenance of equipment and systems until the instructions have been given to the Owner's personnel and the letter of release acknowledged.
- C. In providing the instructions to the Owner's personnel, the written operating and maintenance manuals shall be followed in all instances, and the Owner's personnel shall be familiarized with such manuals. Operating and maintenance manuals used for instructions shall include piping diagrams, valve identification charts, control and interlocking wiring diagrams, manufacturers' operation and maintenance manuals, parts lists (with sources identified), and other data as appropriate for each system, and as required elsewhere in the Specifications to be furnished to the Owner prior to final acceptance of the project.
- D. Provide the Owner with three (3) complete sets of all maintenance manuals, pamphlets, brochures or instructions. This material shall be catalogued, indexed and bound into books.

### **1.12 ACCEPTABLE MANUFACTURERS**

- A. Provide equipment and materials from listed manufacturers listed within this specification. Deviations from this specification will not be acceptable. When one manufacturer is listed, alternate materials and equipment may be provided "equal to" the listed. When more than one manufacturer is listed, equipment and material must be provided by one of the listed manufacturers.

## **PART 2 - PRODUCTS**

### **2.1 STANDARD PRODUCTS**

- A. Each item of equipment furnished under this Division of the Specifications shall be essentially the standard product of the manufacturer. Where two or more units of the same kind or class of equipment are required, these shall be the products of a single manufacturer; however, the component parts of the equipment need not be the products of one manufacturer.
- B. Materials and equipment shall be of the base quality normally used in good commercial practice, and shall be the products of reputable domestic manufacturers unless otherwise

specified. Each major component shall bear a nameplate giving the name and address of the manufacturer, and the catalog number or designation of the component.

## **2.2 QUALITY AND CLASSIFICATION OF MATERIALS**

- A. Materials and equipment shall be new and of the quality specified, and shall be free from defects at the time of installation. Materials or equipment damaged in shipment or otherwise damaged prior to installation shall not be repaired at the job site, but shall be replaced with new materials or equipment identical with those damaged.
- B. Wherever a UL standard has been established for a particular type of material or equipment, each such material or equipment provided on this project shall meet the requirements of the UL standard in every way and shall be UL listed and labeled.

## **2.3 LOCAL PARTS AND SERVICE**

- A. Each item of equipment furnished on this project shall have local representation, factory-authorized service, and an adequate stock of repair parts. "Local" shall be defined, for this purpose, as "within 50 miles of the project site."

## **2.4 FLAME SPREAD PROPERTIES OF MATERIALS**

- A. Materials used for insulation, acoustical linings, adhesives, jackets and coatings, and combinations of these materials, shall each have a flame spread rating of 25 or less, and a smoke developed rating of 50 or less, as determined by an independent testing laboratory in accordance with NFPA-255.

## **2.5 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Dielectric Unions:
    - a. Watts Industries, Inc.; Water Products Div.
    - b. Zurn Industries, Inc.; Wilkins Div.
  - 2. Mechanical Sleeve Seals:
    - a. Calpico, Inc.
    - b. Metraflex Co.
    - c. Thunderline/Link-Seal.

## **2.6 PIPE AND PIPE FITTINGS**

- A. Refer to individual Division 15 piping Sections for pipe and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

## 2.7 JOINING MATERIALS

- A. Refer to individual Division 15 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, unless thickness or specific material is indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
  - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32.
  - 1. Alloy Sn95 or Alloy Sn94: Approximately 95 percent tin and 5 percent silver, with 0.10 percent lead content.
- F. Brazing Filler Metals: AWS A5.8.
  - 1. BCuP Series: Copper-phosphorus alloys.
  - 2. BAg1: Silver alloy.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Solvent Cements: Manufacturer's standard solvent cements for the following:
  - 1. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
  - 2. PVC to ABS Piping Transition: ASTM D 3138.
- I. Plastic Pipe Seals: ASTM F 477, elastomeric gasket.
- J. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.
- K. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.
  - 1. Sleeve: ASTM A 126, Class B, gray iron.
  - 2. Followers: ASTM A 47 malleable iron or ASTM A 536 ductile iron.
  - 3. Gaskets: Rubber.
  - 4. Bolts and Nuts: AWWA C111.
  - 5. Finish: Enamel paint.

## 2.8 DIELECTRIC FITTINGS

- A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.
- B. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.
- C. Insulating Material: Suitable for system fluid, pressure, and temperature.
- D. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

## **2.9 MECHANICAL SLEEVE SEALS**

- A. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.

## **2.10 PIPING SPECIALTIES**

- A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
  1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
  2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
  3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
  4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
    - a. Underdeck Clamp: Clamping ring with set screws.
- B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.
  1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
  2. OD: Completely cover opening.
  3. Cast Brass: One piece, with set screw.
    - a. Finish: Rough brass.
    - b. Finish: Polished chrome-plate.
  4. Cast-Iron Floor Plate: One-piece casting.

## **2.11 GROUT**

- A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.
  1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  2. Design Mix: 5000-psig, 28-day compressive strength.
  3. Packaging: Premixed and factory packaged.

## **PART 3 - EXECUTION**

### **3.1 PIPING SYSTEMS - COMMON REQUIREMENTS**

- A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 15 piping Sections specify unique piping installation requirements.
- B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.
- C. Install piping at indicated slope.
- D. Install components with pressure rating equal to or greater than system operating pressure.
- E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.
- F. Install piping free of sags and bends.
- G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.
- H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- I. Install piping to allow application of insulation plus 1-inch clearance around insulation.
- J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- K. Install fittings for changes in direction and branch connections.
- L. Install couplings according to manufacturer's written instructions.
- M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
  - 1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish.
  - 2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
  - 3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
  - 4. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
  - 5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.
- N. Sleeves are not required for core drilled holes.
- O. Install sleeves for pipes passing through concrete and masonry walls, and concrete floor and roof slabs.
- P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  2. Build sleeves into new walls and slabs as work progresses.
  3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials: Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
    - b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS and larger, penetrating gypsum-board partitions.
  4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants. Refer to Division 7 for materials.
  5. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.
- Q. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe or pipe insulation and sleeve for installing mechanical sleeve seals.
1. Install steel pipe for sleeves smaller than 6 inches in diameter.
  2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.
  3. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
- R. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
- S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials. Refer to Division 7 for materials.
- T. Verify final equipment locations for roughing-in.
- U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- V. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:
1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
  2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
  3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
  4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
    - a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
    - b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
    - c. Align threads at point of assembly.
    - d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
    - e. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
  6. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.
  7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
  8. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:
    - a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
    - b. PVC Nonpressure Piping: ASTM D 2855.
    - c. PVC to ABS Nonpressure Transition Fittings: Procedure and solvent cement according to ASTM D 3138.
  9. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657 procedures and manufacturer's written instructions.
    - a. Plain-End Pipe and Fittings: Use butt fusion.
    - b. Plain-End Pipe and Socket Fittings: Use socket fusion.
- W. Piping Connections: Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
  2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
  3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

### 3.2 EQUIPMENT AND MATERIAL INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment and material to provide maximum possible headroom, if mounting heights are not indicated.

- B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- E. Install equipment and ductwork giving right of way to piping installed at required slope.
- F. Install flexible connectors on equipment side of shutoff valves, horizontally and parallel to equipment shafts if possible.

### **3.3 PAINTING AND FINISHING**

- A. Refer to Division 9 for paint materials, surface preparation, and application of paint.
- B. Do not paint piping specialties with factory-applied finish.
- C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### **3.4 CONCRETE BASES**

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psi, 28-day compressive-strength concrete and reinforcement or as specified in Division 3.

### **3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGE**

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

### **3.6 CUTTING AND PATCHING**

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair cut surfaces to match adjacent surfaces.

### **3.7 GROUTING**

- A. Install nonmetallic, nonshrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.

- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placing of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases to provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout according to manufacturer's written instructions.

**END OF SECTION**

**SECTION 15060  
HANGERS AND SUPPORTS**

**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 hangers and supports for mechanical system piping and equipment.
- B. Related Sections include the following:
  - 1. Division 5 Sections for materials for attaching hangers and supports to building structure.
  - 2. Division 13 Sections on fire-suppression piping for fire-suppression pipe hangers.
  - 3. Division 15 Section "Mechanical Vibration Controls and Seismic Restraints" for vibration isolation and seismic restraint devices.

**1.3 DEFINITIONS**

- A. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

**1.4 PERFORMANCE REQUIREMENTS**

- A. Design channel support systems for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design heavy-duty steel trapezes for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

**1.5 SUBMITTALS**

- A. Product Data: For each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer for multiple piping supports and trapeze hangers. Include design calculations and indicate size and characteristics of components and fabrication details.

**1.6 QUALITY ASSURANCE**

- A. Engineering Responsibility: Design and preparation of Shop Drawings and calculations for each multiple pipe support and trapeze by a qualified professional engineer.
  - 1. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of hangers and supports that are similar to those indicated for this Project in material, design, and extent.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Pipe Hangers:
    - a. Globe Pipe Hanger Products, Inc.
    - b. Grinnell Corp.
    - c. Michigan Hanger Co., Inc.

### **2.2 MANUFACTURED UNITS**

- A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components. Refer to "Hanger and Support Applications" Article in Part 3 for where to use specific hanger and support types.
  - 1. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
  - 2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- B. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.
  - 1. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

### **2.3 MISCELLANEOUS MATERIALS**

- A. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- B. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.

## **PART 3 - EXECUTION**

### **3.1 HANGER AND SUPPORT APPLICATIONS**

- A. Specific hanger requirements are specified in Sections specifying equipment and systems.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.
- C. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification 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. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
  - 3. Extension Hinged Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3.
- D. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
  - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
- E. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
  - 1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
  - 2. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
  - 3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
  - 4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- F. Building Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
  - 1. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction to attach to top flange of structural shape.
  - 2. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
  - 3. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
  - 4. C-Clamps (MSS Type 23): For structural shapes.
  - 5. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
  - 6. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
  - 7. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
  - 8. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
- G. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification 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 by manufacturer to prevent crushing insulation.

- H. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification sections, install the following types:
  - 1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
  - 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).

### 3.2 HANGER AND SUPPORT INSTALLATION

- A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems.
  - 1. Field assemble and install according to manufacturer's written instructions.
- C. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes.
  - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
  - 2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.
- D. Install building attachments within concrete slabs or attach to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, 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.
- E. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- F. 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.
- G. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- H. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.
- I. Insulated Piping: Comply with the following:
  - 1. Attach clamps and spacers to piping.
    - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

- b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
  - c. Do not exceed pipe stress limits according to ASME B31.9.
2. 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 inserts.
6. Insert Material: Length at least as long as protective shield.

### **3.3 EQUIPMENT SUPPORTS**

- A. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

### **3.4 ADJUSTING**

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

**END OF SECTION**

**SECTION 15140**  
**SUPPORTS AND ANCHORS**

**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

- A. Pipe, and equipment hangers, supports and associated anchors.
- B. Sleeves and seals.
- C. Flashing and sealing equipment and pipe stacks.

**1.02 RELATED WORK**

- A. Section 15240 - Vibration Isolation.
- B. Section 15260 - Piping Insulation.
- C. Section 15280 - Equipment Insulation.
- D. Section 15330 – Wet Pipe Fire Protection Sprinkler System.
- E. Section 15410 - Plumbing Piping and Valves.
- F. Section 15510 - Hydronic Piping.
- G. Section 15530 – Refrigerant Piping

**1.03 REFERENCES**

- A. ANSI/ASME B31.1 - Power Piping.
- B. NFPA 13 - Standard for the Installation of Sprinkler Systems.
- C. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems.

**1.04 QUALITY ASSURANCE**

- A. Supports for Sprinkler Piping: In conformance with NFPA 13.
- B. Supports for Standpipes: In conformance with NFPA 14.

**1.05 SUBMITTALS**

- A. Submit shop drawings and product data under provisions of Division One.
- B. Indicate hanger and support framing and attachment methods.

**PART 2 - PRODUCTS**

**2.01 PIPE HANGERS AND SUPPORTS**

- A. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch Malleable iron, adjustable swivel, split ring.

- B. Hangers for Pipe Sizes 2 to 4 Inches Carbon steel, adjustable, clevis.
- C. Hangers for Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.
- D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods; cast iron roll and stand for pipe sizes 6 inches and over.
- E. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
- F. Wall Support for Pipe Sizes 4 Inches and over: adjustable steel yoke and cast iron roll.
- G. Vertical Support: Steel riser clamp.
- H. Floor Support for Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.
- I. Floor Support for Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
- J. Roof Pipe Supports and Hangers: Galvanized Steel Channel System as manufactured by Portable Pipe Hangers, Inc. or approved equal.  
  
 For pipes 2-1/2" and smaller – Type PP10 with roller  
 For pipes 3" through 8" – Type PS  
 For multiple pipes – Type PSE - Custom
- K. Copper Pipe Support and Hangers: Electro-galvanized with thermoplastic elastomer cushions; Unistrut "Cush-A-Clamp" or equal. Hangers: Plastic coated; Unistrut or equal.
- L. For installation of protective shields refer to specification section 15140-3.03.
- M. Shields for Vertical Copper Pipe Risers: Sheet lead.
- N. Pipe Rough-In Supports in Walls/Chases: Provide preformed plastic pipe supports, Sioux Chief "Pipe Titan", Holdrite or equal.

## 2.02 HANGER RODS

- A. Galvanized Hanger Rods: Threaded both ends, threaded one end, or continuous threaded.

## 2.03 INSERTS

- A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

## 2.04 FLASHING

- A. Metal Flashing: 20 gage galvanized steel.
- B. Lead Flashing: 4 lb. /sq. ft. sheet lead for waterproofing; 1 lb. /sq. ft. sheet lead for soundproofing.
- C. Caps: Steel, 20 gage minimum; 16 gage at fire resistant elements.

- D. Coordinate with roofing contractor/architect for type of flashing on metal roofs.

#### 2.05 EQUIPMENT CURBS

- A. Fabricate curbs of hot dipped galvanized steel.
- B. For metal roof construction, roof curbs shall be made of aluminum or stainless steel. Coordinate with architectural drawings and details.

#### 2.06 SLEEVES

- A. Sleeves for Pipes through Non-fire Rated Floors: Form with 18 gage galvanized steel, tack welded to form a uniform sleeve.
- B. Sleeves for Pipes through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with steel pipe, schedule 40.
- C. Sleeves for Pipes through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Prefabricated fire rated steel sleeves including seals, UL listed.
- D. Sleeves for Round Ductwork: Form with galvanized steel.
- E. Sleeves for Rectangular Ductwork: Form with galvanized steel.
- F. Fire Stopping Insulation: Glass fiber type, non-combustible, U.L. listed.
- G. Caulk: Paintable 25-year acrylic sealant.
- H. Pipe Alignment Guides: Factory fabricated, of cast semi-steel or heavy fabricated steel, consisting of bolted, two-section outer cylinder and base with two-section guiding spider that bolts tightly to pipe. Length of guides shall be as recommended by manufacturer to allow indicated travel.

#### 2.07 FABRICATION

- A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- B. Design hangers without disengagement of supported pipe.
- C. Design roof supports without roof penetrations, flashing or damage to the roofing material.

#### 2.08 FINISH

- A. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

### PART 3 - EXECUTION

#### 3.01 INSERTS

- A. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams. Coordinate with structural engineer for placement of inserts.
- B. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4

inches.

- C. Where concrete slabs form finished ceiling, provide inserts to be flush with slab surface.
- D. Where inserts are omitted, drill through concrete slab from below and provide thru-bolt with recessed square steel plate and nut recessed into and grouted flush with slab. Verify with structural engineer prior to start of work.

### 3.02 PIPE HANGERS AND SUPPORTS

- A. Support horizontal piping as follows:

<u>PIPE SIZE</u>	<u>MAX. HANGER SPACING</u>	<u>HANGER DIAMETER</u>
(Steel Pipe)		
1/2 to 1-1/4 inch	7'-0"	3/8"
1-1/2 to 3 inch	10'-0"	3/8"
4 to 6 inch	10'-0"	1/2"
8 to 10 inch	10'-0"	5/8"
12 to 14 inch	10'-0"	3/4"
15 inch and over	10'-0"	7/8"
(Copper Pipe)		
1/2 to 1-1/4 inch	5'-0"	3/8"
1-1/2 to 2-1/2 inch	8'-0"	3/8"
3 to 4 inch	10'-0"	3/8"
6 to 8 inch	10'-0"	1/2"
(Cast Iron)		
2 to 3 inch	5'-0"	3/8"
4 to 6 inch	10'-0"	1/2"
8 to 10 inch	10'-0"	5/8"
12 to 14 inch	10'-0"	3/4"
15 inch and over	10'-0"	7/8"
(PVC Pipe)		
1-1/2 to 4 inch	4'-0"	3/8"
6 to 8 inch	4'-0"	1/2"
10 and over	4'-0"	5/8"

- B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

- C. Place a hanger within 12 inches of each horizontal elbow and at the vertical horizontal transition.
- D. Use hangers with 1-1/2 inch minimum vertical adjustment.
- E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
- G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.
- I. Install hangers with nut at base and above hanger; tighten upper nut to hanger after final installation adjustments.
- J. Portable pipe hanger systems shall be installed per manufacturers' instructions.
- K. Distances between supports are maximum distance. Supports shall be provided to carry the pipe/equipment load.

3.03 Insulated Piping: Comply with the following installation requirements.

- A. Clamps: Attach galvanized clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.9.
- B. Saddles: Install galvanized protection saddles MSS Type 39 where insulation without vapor barrier is indicated. Fill interior voids with segments of insulation that match adjoining pipe insulation.
- C. Shields: Install protective shields MSS Type 40 on cold and chilled water piping that has vapor barrier. Shields shall span an arc of 180 degrees and shall have dimensions in inches not less than the following:

<u>NPS</u>	<u>LENGTH</u>	<u>THICKNESS</u>
1/4 THROUGH 3-1/2	12	0.048
4	12	0.060
5 & 6	18	0.060
8 THROUGH 14	24	0.075
16 THROUGH 24	24	0.105

- D. Piping 2" and larger provide galvanized sheet metal shields with calcium silicate at hangers/supports.
- E. Insert material shall be at least as long as the protective shield.
- F. Thermal Hanger Shields: Install where indicated, with insulation of same thickness as piping.

3.04 EQUIPMENT BASES AND SUPPORTS

- A. Provide equipment bases of concrete.

- B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct support of steel members. Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed.

### 3.05 FLASHING

- A. Provide flexible flashing and metal counter flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Flash vent and soil pipes projecting 8 inches minimum above finished roof surface with lead worked one inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter flash and seal.
- C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.
- D. Seal floor shower mop sink and all other drains watertight to adjacent materials.
- E. Provide curbs for mechanical roof installations 8 inches minimum high above roofing surface. Contact architect for all flashing details and roof construction. Seal penetrations watertight.

### 3.06 SLEEVES

- A. Set sleeves in position in formwork. Provide reinforcing around sleeves.
- B. Extend sleeves through floors minimum one inch above finished floor level. Caulk sleeves full depth with fire rated thermfiber and 3M caulking and provide floor plate.
- C. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with U.L. listed fire stopping insulation and caulk seal air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- D. Fire protection sleeves may be flush with floor of stairways.

**END OF SECTION**

**SECTION 15075  
MECHANICAL 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 the following mechanical identification materials and their installation:
  - 1. Equipment nameplates.
  - 2. Equipment markers.
  - 3. Access panel and door markers.
  - 4. Pipe markers.
  - 5. Duct markers.
  - 6. Valve tags.

**1.3 SUBMITTALS**

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

**1.4 COORDINATION**

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with location of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

**PART 2 - PRODUCTS**

**2.1 EQUIPMENT IDENTIFICATION DEVICES**

- A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.
  - 1. Data:
    - a. Manufacturer, product name, model number, and serial number.
    - b. Capacity, operating and power characteristics, and essential data.
    - c. Labels of tested compliances.

2. Location: Accessible and visible.
  3. Fasteners: As required to mount on equipment.
- B. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.
1. Terminology: Match schedules as closely as possible.
  2. Data:
    - a. Name and plan number.
    - b. Equipment service.
    - c. Design capacity.
    - d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.
  3. Size: 2-1/2 by 4 inches (64 by 100 mm) for control devices, dampers, and valves; 4-1/2 by 6 inches (115 by 150 mm) for equipment.
  4. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

## 2.2 PIPING IDENTIFICATION DEVICES

- A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.
1. Colors: Comply with ASME A13.1, unless otherwise indicated.
  2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
  3. Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): Full-band pipe markers extending 360 degrees around pipe at each location.
  4. Pipes with OD, Including Insulation, 6 Inches (150 mm) and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
  5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.
- B. Pretensioned Pipe Markers: Precoiled semirigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.
- C. Shaped Pipe Markers: Preformed semirigid plastic formed to partially cover circumference of pipe and to attach to pipe with mechanical fasteners that do not penetrate insulation vapor barrier.
- D. Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive back.
- E. Plastic Tape: Continuously printed, vinyl tape at least 3 mils (0.08 mm) thick with pressure-sensitive, permanent-type, self-adhesive back.
1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): 3/4 inch (19 mm) minimum.
  2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches (150 mm) or Larger: 1-1/2 inches (38 mm) minimum.

## 2.3 DUCT IDENTIFICATION DEVICES

- A. Duct Markers: Engraved, color-coded laminated plastic. Include direction and quantity of airflow and duct service (such as supply, return, and exhaust). Include contact-type, permanent adhesive.

## 2.4 VALVE TAGS

- A. Valve Tags: Stamped or engraved with **1/4-inch (6.4-mm)** letters for piping system abbreviation and **1/2-inch (13-mm)** numbers, with numbering scheme [approved by Architect] <Insert other>. Provide **5/32-inch (4-mm)** hole for fastener.
  1. Material: **3/32-inch- (2.4-mm-)** thick laminated plastic with 2 black surfaces and white inner layer.
  2. Valve-Tag Fasteners: Brass wire-link or beaded chain; or S-hook.

## PART 3 - EXECUTION

### 3.1 APPLICATIONS, GENERAL

- A. Products specified are for applications referenced in other Division 15 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

### 3.2 EQUIPMENT IDENTIFICATION

- A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:
  1. Pumps, compressors, chillers, condensers, and similar motor-driven units.
  2. Heat exchangers, coils, evaporators, and similar equipment.
  3. Fans, blowers, primary balancing dampers, and mixing boxes.
  4. Packaged HVAC central-station and zone-type units.
- B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.
  1. Letter Size: Minimum **1/4 inch (6.4 mm)** for name of units if viewing distance is less than **24 inches (600 mm)**, **1/2 inch (13 mm)** for viewing distances up to **72 inches (1830 mm)**, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
  2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
  3. Locate markers where accessible and visible. Include markers for the following general categories of equipment:
    - a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
    - b. Fire department hose valves and hose stations.
    - c. Meters, gages, thermometers, and similar units.

- d. Pumps, compressors, chillers, condensers, and similar motor-driven units.
  - e. Heat exchangers, coils, evaporators, and similar equipment.
  - f. Fans, blowers, primary balancing dampers, and mixing boxes.
  - g. Packaged HVAC central-station and zone-type units.
  - h. Strainers, filters, humidifiers, water-treatment systems, and similar equipment.
- C. Install equipment signs with screws or permanent adhesive on or near each major item of mechanical equipment. Locate signs where accessible and visible.
1. Identify mechanical equipment with equipment markers in the following color codes:
    - a. Green: For cooling equipment and components.
    - b. Yellow: For heating equipment and components.
    - c. Orange: For combination cooling and heating equipment and components.
  2. Letter Size: Minimum **1/4 inch (6.4 mm)** for name of units if viewing distance is less than **24 inches (600 mm)**, **1/2 inch (13 mm)** for viewing distances up to **72 inches (1830 mm)**, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
  3. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
  4. Include signs for the following general categories of equipment:
    - a. Main control and operating valves, including safety devices.
    - b. Pumps, compressors, chillers, condensers, and similar motor-driven units.
    - c. Heat exchangers, coils, evaporators, and similar equipment.
    - d. Fans, blowers, primary balancing dampers, and mixing boxes.
    - e. Packaged HVAC central-station and zone-type units.
    - f. Tanks and pressure vessels.
    - g. Strainers, filters, humidifiers, water-treatment systems, and similar equipment.
- D. Install access panel markers with screws on equipment access panels.

### 3.3 PIPING IDENTIFICATION

- A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.
1. Pipes with OD, Including Insulation, Less Than **6 Inches (150 mm)**: Pretensioned pipe markers. Use size to ensure a tight fit.
  2. Pipes with OD, Including Insulation, **6 Inches (150 mm)** and Larger: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least **1-1/2 inches (38 mm)** wide, lapped at least **3 inches (75 mm)** at both ends of pipe marker, and covering full circumference of pipe.
- B. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior nonconcealed locations as follows:
1. Near each valve and control device.
  2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
  3. Near penetrations through walls, floors, ceilings, and nonaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of **50 feet (15 m)** along each run. Reduce intervals to **25 feet (7.6 m)** in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced markers.

### 3.4 DUCT IDENTIFICATION

- A. Install duct markers with permanent adhesive on air ducts in the following color codes:
  1. Green: For cold-air supply ducts.
  2. Blue: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
  3. ASME A13.1 Colors and Designs: For hazardous material exhaust.
  4. Letter Size: Minimum **1/4 inch (6.4 mm)** for name of units if viewing distance is less than **24 inches (600 mm)**, **1/2 inch (13 mm)** for viewing distances up to **72 inches (1830 mm)**, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- B. Locate markers near points where ducts enter into concealed spaces and at maximum intervals of **50 feet (15 m)** in each space where ducts are exposed or concealed by removable ceiling system.

### 3.5 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:
  1. Valve-Tag Size and Shape:
    - a. Cold Water: **1-1/2 inches (38 mm)**, round.
    - b. Hot Water: **1-1/2 inches (38 mm)**, round.
    - c. Fire Protection: **2 inches (50 mm)**, round.
  2. Valve-Tag Color:
    - a. Cold Water: Green.
    - b. Hot Water: Yellow.
    - c. Fire Protection: Red.
  3. Letter Color:
    - a. Cold Water: White.
    - b. Hot Water: White.
    - c. Fire Protection: White.

### 3.6 VALVE-SCHEDULE INSTALLATION

- A. Mount valve schedule on wall in accessible location in each major equipment room.

### **3.7 ADJUSTING**

- A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

### **CLEANING**

- B. Clean faces of mechanical identification devices and glass frames of valve schedules.

**END OF SECTION**

## **SECTION 15081 DUCT INSULATION**

### **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 semirigid and flexible duct, plenum, and breeching insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.
- B. Related Sections include the following:
  - 1. Division 7 Sections for firestopping materials and requirements for penetrations through fire and smoke barriers.
  - 2. Division 15 Section "Pipe Insulation" for insulation for piping systems.
  - 3. Division 15 Section "Metal Ducts" for duct liner.

#### **1.3 SUBMITTALS**

- A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

#### **1.4 QUALITY ASSURANCE**

- A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
  - 1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
  - 2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.
- B. Deliver and store all insulation with protective material until installation. Any material left exposed to moisture and/or particulates shall be removed and replaced.

- C. Any installed insulation left temporarily incomplete shall be covered with protective material until final connections can be installed.

## **1.6 COORDINATION**

- A. Coordinate clearance requirements with duct Installer for insulation application.

## **1.7 SCHEDULING**

- A. Schedule insulation application after testing duct systems. Insulation application may begin on segments of ducts that have satisfactory test results.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Mineral-Fiber Insulation:
    - a. CertainTeed Manson.
    - b. Knauf FiberGlass GmbH.
    - c. Owens-Corning Fiberglas Corp.
    - d. Schuller International, Inc.

### **2.2 INSULATION MATERIALS**

- A. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film

### **2.3 Field Applied Jacket**

- A. Foil and paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

### **2.4 ACCESSORIES AND ATTACHMENTS**

- A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd. (270 g/sq. m).
  - 1. Tape Width: 4 inches (100 mm).
- B. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

1. Adhesive: Recommended by the anchor pin manufacturer as appropriate for surface temperatures of ducts, plenums, and breechings; and to achieve a holding capacity of 100 lb (45 kg) for direct pull perpendicular to the adhered surface.

## **2.5 VAPOR RETARDERS**

- A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
- 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 APPLICATION REQUIREMENTS**

- A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.
- B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each duct system.
- C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Apply multiple layers of insulation with longitudinal and end seams staggered.
- E. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
- F. Keep insulation materials dry during application and finishing.
- G. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- H. Apply insulation with the least number of joints practical.
- I. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

- J. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.
- K. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
- L. Apply insulation with integral jackets as follows:
  - 1. Pull jacket tight and smooth.
  - 2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
  - 3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- M. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.
- N. Install vapor-retarder mastic on ducts and plenums scheduled to receive vapor retarders.
  - 1. Ducts with Vapor Retarders: Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-retarder seal.
  - 2. Ducts without Vapor Retarders: Overlap insulation facing at seams and secure with outward clinching staples and pressure-sensitive tape having same facing as insulation.
- O. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.
  - 1. Seal penetrations with vapor-retarder mastic.
  - 2. Apply insulation for exterior applications tightly joined to interior insulation ends.
  - 3. Seal insulation to roof flashing with vapor-retarder mastic.
- P. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.
- Q. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations.
- R. Floor Penetrations: Terminate insulation at underside of floor assembly and at floor support at top of floor.
  - 1. For insulation indicated to have vapor retarders, taper termination and seal insulation ends with vapor-retarder mastic.

### **3.4 MINERAL-FIBER INSULATION APPLICATION**

- A. Blanket Applications for Ducts and Plenums: Secure blanket insulation with adhesive and anchor pins and speed washers.
  - 1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.

2. Install anchor pins and speed washers on sides and bottom of horizontal ducts and all sides of vertical ducts as follows:
  - a. On duct sides with dimensions 18 inches (450 mm) and smaller, along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
  - b. On duct sides with dimensions larger than 18 inches (450 mm). Space 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
  - c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
  - d. Do not overcompress insulation during installation.
3. Impale insulation over anchors and attach speed washers.
4. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
5. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch (13-mm) staples, 1 inch (25 mm) o.c., and cover with pressure-sensitive tape having same facing as insulation.
6. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. Secure with steel band at end joints and spaced a maximum of 18 inches (450 mm) o.c.
7. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Apply insulation on round duct elbows with individually mitered gores cut to fit the elbow.
8. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch- (150-mm-) wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches (150 mm) o.c.
9. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

### 3.5 DUCT SYSTEM APPLICATIONS

- A. Insulation materials and thicknesses are specified in schedules at the end of this Section.
- B. Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.
- C. Insulate the following plenums and duct systems:
  1. Indoor concealed supply-, return-, and outside-air ductwork.
  2. Indoor exposed supply-, return-, and outside-air ductwork.
  3. Indoor concealed range-hood exhaust ductwork.
  4. Indoor concealed dishwasher ductwork.
- D. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
  1. Factory-insulated flexible ducts.
  2. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.
  3. Flexible connectors.

4. Vibration-control devices.
5. Testing agency labels and stamps.
6. Nameplates and data plates.
7. Access panels and doors in air-distribution systems.

### **3.6 INDOOR DUCT AND PLENUM APPLICATION SCHEDULE**

- A. Service: Round and rectangular, supply-air ducts, concealed.
1. Material: Mineral-fiber blanket.
  2. Thickness: 3 inches (R-8 or greater)
  3. Number of Layers: One.
  4. Field-Applied Jacket: Foil and paper.
  5. Vapor Retarder Required: Yes.
- B. Service: Round and rectangular, return-air ducts, outside air duct, concealed or exposed.
1. Material: Mineral-fiber blanket.
  2. Thickness: 2 inches (50 mm).
  3. Number of Layers: One.
  4. Field-Applied Jacket: Foil and Paper
  5. Vapor Retarder Required: Yes.
- C. Service: Round and rectangular, supply and return-air ducts, exposed and in mechanical rooms.
1. Material: 2" liner insulation
  2. Thickness: 2 inches (50 mm).
  3. Number of Layers: One.
  4. Field-Applied Jacket: None.
  5. Vapor Retarder Required: No
- D. Service: Round and rectangular, exhaust air ducts, concealed & exposed and in mechanical rooms.
1. Material: 1" Interior liner
  2. Thickness: 1 inches
  3. Number of Layers: One.
  4. Field-Applied Jacket: None.
  5. Vapor Retarder Required: No
  - 6.

**END OF SECTION**

## **SECTION 15083 PIPE INSULATION**

### **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 preformed, rigid and flexible pipe insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.
- B. Related Sections include the following:
  - 1. Division 2 for loose-fill pipe insulation in underground piping outside the building.
  - 2. Division 7 for firestopping materials and requirements for penetrations through fire and smoke barriers.
  - 3. Division 15 Section "Duct Insulation" for insulation for ducts and plenums.
  - 4. Division 15 Section "Equipment Insulation" for insulation materials and application for pumps, tanks, hydronic specialties, and other equipment.
  - 5. Division 15 Section "Hangers and Supports" for pipe insulation shields and protection saddles.

#### **1.3 SUBMITTALS**

- A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

#### **1.4 QUALITY ASSURANCE**

- A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
  - 1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
  - 2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

## 1.6 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 15 Section "Hangers and Supports."
- B. Coordinate clearance requirements with piping Installer for insulation application.
- C. Coordinate installation and testing of steam or electric heat tracing.

## 1.7 SCHEDULING

- A. Schedule insulation application after testing piping systems and, where required, after installing and testing heat-trace tape. Insulation application may begin on segments of piping that have satisfactory test results.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Mineral-Fiber Insulation:
    - a. CertainTeed Manson.
    - b. Knauf FiberGlass GmbH.
    - c. Owens-Corning Fiberglas Corp.
    - d. Schuller International, Inc.
  - 2. Cellular-Glass Insulation:
    - a. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.
  - 3. Flexible Elastomeric Thermal Insulation:
    - a. Armstrong World Industries, Inc.
    - b. Rubatex Corp.

### 2.2 INSULATION MATERIALS

- A. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:
  - 1. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket.
  - 2. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:
    - a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.
    - b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.

3. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.
  4. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.
  5. Expanded or Exfoliated Vermiculite Insulating Cements: Comply with ASTM C 196.
  6. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.
- B. Cellular-Glass Insulation: Inorganic, foamed or cellulated glass, annealed, rigid, hermetically sealed cells, incombustible.
1. Preformed Pipe Insulation, without Jacket: Comply with ASTM C 552, Type II, Class 1.
  2. Preformed Pipe Insulation, with Jacket: Comply with ASTM C 552, Type II, Class 2.
- C. Closed-Cell Phenolic-Foam Insulation: Preformed pipe insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type III, Grade 1.
- D. Flexible Elastomeric Thermal Insulation used on Refrigerant Piping: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
1. Adhesive: As recommended by insulation material manufacturer.
  2. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.
- E. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.

## 2.3 FIELD-APPLIED JACKETS

- A. General: ASTM C 921, Type 1, unless otherwise indicated.
- B. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.
- C. Standard PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil- (0.5-mm-) thick, high-impact, ultraviolet-resistant PVC.
1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.
  2. Adhesive: As recommended by insulation material manufacturer.
- D. Aluminum Jacket: Factory cut and rolled to indicated sizes. Comply with ASTM B 209 (ASTM B 209M), 3003 alloy, H-14 temper.
1. Finish and Thickness: Smooth finish, 0.010 inch (0.25 mm) thick.
  2. Moisture Barrier: 1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper.
  3. Elbows: Preformed, 45- and 90-degree, short- and long-radius elbows; same material, finish, and thickness as jacket.
- E. Underground Direct-Buried Jacket: 125-mil-thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.
1. Products:
    - a. Pittsburgh Corning Corporation; Pittwrap.
    - b. Polyguard; Insulrap No Torch 125.

## **2.4 ACCESSORIES AND ATTACHMENTS**

- A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd. (270 g/sq. m).
  - 1. Tape Width: 4 inches (100 mm).
- B. Bands: 3/4 inch (19 mm) wide, in one of the following materials compatible with jacket:
  - 1. Aluminum: 0.007 inch (0.18 mm) thick.

## **2.5 VAPOR RETARDERS**

- A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

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

### **3.2 PREPARATION**

- A. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

### **3.3 GENERAL APPLICATION REQUIREMENTS**

- A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.
- B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.
- C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Apply insulation with longitudinal seams at top and bottom of horizontal pipe runs.
- E. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- F. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

- G. Keep insulation materials dry during application and finishing.
- H. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- I. Apply insulation with the least number of joints practical.
- J. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.
- K. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.
  - 1. Apply insulation continuously through hangers and around anchor attachments. Insulation around hanger or pipe clamp will not be acceptable.
  - 2. For insulation application where vapor retarders are indicated, extend insulation on anchor legs at least 12 inches (300 mm) from point of attachment to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
  - 3. Install insert materials and apply insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.
  - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.
- L. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
- M. Apply adhesives and mastics at the manufacturer's recommended coverage rate.
- N. Apply insulation with integral jackets as follows:
  - 1. Pull jacket tight and smooth.
  - 2. Circumferential Joints: Cover with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches (100 mm) o.c.
  - 3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches (40 mm). Apply 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 (100 mm) o.c.
    - a. Exception: Do not staple longitudinal laps on insulation having a vapor retarder.
  - 4. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.
  - 5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.
- O. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.
  - 1. Seal penetrations with vapor-retarder mastic.

2. Apply insulation for exterior applications tightly joined to interior insulation ends.
  3. Extend metal jacket of exterior insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
  4. Seal metal jacket to roof flashing with vapor-retarder mastic.
- P. Exterior Wall Penetrations: For penetrations of below-grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor-retarder mastic.
- Q. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.
- R. Fire-Rated Wall and Partition Penetrations: Apply insulation continuously through penetrations of fire-rated walls and partitions.
1. Firestopping and fire-resistive joint sealers are specified in Division 7 Section "Firestopping."

### **3.4 MINERAL-FIBER INSULATION APPLICATION**

- A. Apply insulation to straight pipes and tubes as follows:
1. Secure each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.
  2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic. Apply vapor retarder to ends of insulation at intervals of 15 to 20 feet (4.5 to 6 m) to form a vapor retarder between pipe insulation segments.
  3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
  4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.
- B. Apply insulation to flanges as follows:
1. Apply preformed pipe insulation to outer diameter of pipe flange.
  2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the 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. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.
- C. Apply insulation to fittings and elbows as follows:
1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
  2. When premolded insulation elbows and fittings are not available, apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
  3. Cover fittings with standard PVC fitting covers.
- D. Apply insulation to valves and specialties as follows:
1. Apply premolded segments of cellular-glass insulation or glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation

without disturbing insulation. For check valves, arrange insulation for access to strainer basket without disturbing insulation.

2. Apply insulation to flanges as specified for flange insulation application.
3. Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
4. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

### **3.5 CELLULAR-GLASS INSULATION APPLICATION**

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of insulation to pipe with wire, tape, or bands without deforming insulation materials.
2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic.
3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of the same thickness as pipe insulation.
4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturers written instructions.
2. When premolded sections of insulation are not available, apply mitered sections of cellular-glass insulation. Secure insulation materials with wire, tape, or bands.
3. Cover fittings with heavy PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch (25 mm) at each end. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

D. Apply insulation to valves and specialties as follows:

1. Apply premolded segments of cellular-glass insulation or glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to strainer basket without disturbing insulation.
2. Apply insulation to flanges as specified for flange insulation application.
3. Use preformed heavy PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

4. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

### **3.6 CLOSED-CELL PHENOLIC-FOAM INSULATION APPLICATION**

- A. Apply insulation to straight pipes and tubes as follows:
  1. Secure each layer of insulation to pipe with wire, tape, or bands without deforming insulation materials.
  2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic.
  3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.
  4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.
- B. Apply insulation to flanges as follows:
  1. Apply preformed pipe insulation to outer diameter of pipe flange.
  2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
  3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of the same thickness as pipe insulation.
  4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.
- C. Apply insulation to fittings and elbows as follows:
  1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
  2. When premolded sections of insulation are not available, apply mitered sections of phenolic-foam insulation. Secure insulation materials with wire, tape, or bands.
  3. Cover fittings with heavy PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch (25 mm) at each end. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
- D. Apply insulation to valves and specialties as follows:
  1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
  2. When premolded sections of insulation are not available, apply mitered sections of phenolic-foam insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to stainer basket without distributing insulation.
  3. Apply insulation to flanges as specified for flange insulation application.
  4. Use preformed heavy PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
  5. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

### **3.7 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION**

- A. Apply insulation to straight pipes and tubes as follows:
  - 1. Follow manufacturer's written instructions for applying insulation.
  - 2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.
  
- B. Apply insulation to flanges as follows:
  - 1. Apply pipe insulation to outer diameter of pipe flange.
  - 2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the 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 the same thickness as pipe insulation.
  - 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.
  
- C. Apply insulation to fittings and elbows as follows:
  - 1. Apply mitered sections of pipe insulation.
  - 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.
  
- D. Apply insulation to valves and specialties as follows:
  - 1. Apply preformed valve covers manufactured of the same material as pipe insulation and attached according to the manufacturer's written instructions.
  - 2. Apply cut segments of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, fabricate removable sections of insulation arranged to allow access to stainer basket.
  - 3. Apply insulation to flanges as specified for flange insulation application.
  - 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

### **3.8 FIELD-APPLIED JACKET APPLICATION**

- A. Apply glass-cloth jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.
  - 1. Apply jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
  - 2. Embed glass cloth between two 0.062-inch- (1.6-mm-) thick coats of jacket manufacturer's recommended adhesive.
  - 3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.
  
- B. Foil and Paper Jackets: Apply foil and paper jackets where indicated.
  - 1. Draw jacket material smooth and tight.
  - 2. Apply lap or joint strips with the same material as jacket.
  - 3. Secure jacket to insulation with manufacturer's recommended adhesive.

4. Apply jackets with 1-1/2-inch (40-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
  5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-retarder mastic.
- C. Apply metal jacket where indicated, with 2-inch (50-mm) 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 (300 mm) o.c. and at end joints.

### **3.9 PIPING SYSTEM APPLICATIONS**

- A. Insulation materials and thicknesses are specified in schedules at the end of this Section.
- B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
1. Flexible connectors.
  2. Fire-suppression piping.
  3. Drainage piping located in crawl spaces, unless otherwise indicated.
  4. Below-grade piping, unless otherwise indicated.
  5. Chrome-plated pipes and fittings, unless potential for personnel injury.
  6. Air chambers, unions, strainers, check valves, plug valves, and flow regulators.

### **3.10 INTERIOR INSULATION APPLICATION SCHEDULE**

- A. Service: Domestic hot and recirculated hot water.
1. Operating Temperature: 60 to 140 deg F (15 to 60 deg C).
  2. Insulation Material: Mineral fiber
  3. Insulation Thickness: 1" thick
  4. Field-Applied Jacket: Foil and Paper(ASJ)
  5. Vapor Retarder Required: No
  6. Finish: None.
- B. Service: Condensate and equipment drain piping.
1. Operating Temperature: 40 to 60 deg F
  2. Insulation Material: Flexible elastomeric, only on first ten feet of pipe from trap.
  3. Insulation Thickness: 3/4"
  4. Field-Applied Jacket: None.
  5. Vapor Retarder Required: No.
  6. Finish: Two coats of the insulation manufacturer's recommended protective coating.
- C. Service: Refrigerant suction and hot-gas piping.
1. Operating Temperature: 35 to 50 deg F
  2. Insulation Material: Flexible elastomeric.
  3. Insulation Thickness: 1" thick.
  4. Field-Applied Jacket: Aluminum Jacket on building exterior application only.
  5. Vapor Retarder Required: Yes.
  6. Finish: None.

- D. Service: Domestic water piping.
1. Operating Temperature: 60 to 80 deg F
  2. Insulation Material: Mineral Fiber
  3. Insulation Thickness: 1" thick.
  4. Field-Applied Jacket: Foil and Paper(ASJ)
  5. Vapor Retarder Required: Yes.
  6. Finish: None.
- E. Service: For obtaining fire/smoke rating in return air plenum (calbes, PE, PB, PP, ABS, PVC, CPVC, etc).
1. Operating Temperature: 35 to 90 deg F
  2. Insulation Material: 3M Fire Barrier Plenum Wrap 5 A or equal.
  3. Insulation Thickness: larger of 1" or mfr's recommendations.
  4. Field-Applied Jacket: scrim reinforced foil
  5. Vapor Retarder Required: None.
  6. Finish: None.

### **3.11 EXTERIOR INSULATION APPLICATION SCHEDULE**

- A. Service: Domestic water.
1. Operating Temperature: 60 to 140 deg F (15 to 60 deg C).
  2. Insulation Material: Mineral fiber.
  3. Insulation Thickness: Apply the following insulation thicknesses: 1"
  4. Field-Applied Jacket: Aluminum.
  5. Vapor Retarder Required: Yes.
  6. Finish: None.
- B. Service: Refrigerant suction.
1. Operating Temperature: 35 to 50 deg F (2 to 10 deg C).
  2. Insulation Material: Flexible elastomeric.
  3. Insulation Thickness: Apply the following insulation thicknesses: ½"
  4. Field-Applied Jacket: Aluminum
  5. Vapor Retarder Required: Yes.
  6. Finish: None.

**END OF SECTION**

## **SECTION 15110 VALVES**

### **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 general-duty valves:
  - 1. Copper-alloy ball valves.
  - 2. Bronze check valves.
  - 3. Bronze gate valves.
  - 4. Cast-iron gate valves.
- B. Related Sections include the following:
  - 1. Division 2 piping Sections for general-duty and specialty valves for site construction piping.
  - 2. Division 13 fire-suppression piping and fire pump Sections for fire-protection valves.
  - 3. Division 15 Section "Mechanical Identification" for valve tags and charts.
  - 4. Division 15 piping Sections for specialty valves applicable to those Sections only.

#### **1.3 DEFINITIONS**

- A. The following are standard abbreviations for valves:
  - 1. CWP: Cold working pressure.
  - 2. EPDM: Ethylene-propylene-diene terpolymer rubber.
  - 3. NBR: Acrylonitrile-butadiene rubber.
  - 4. PTFE: Polytetrafluoroethylene plastic.
  - 5. SWP: Steam working pressure.
  - 6. TFE: Tetrafluoroethylene plastic.

#### **1.4 SUBMITTALS**

- A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

#### **1.5 QUALITY ASSURANCE**

- A. ASME Compliance: ASME B31.9 for building services piping valves.

1. Exceptions: , sanitary waste, and storm drainage piping valves unless referenced.
- B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.
- C. NSF Compliance: NSF 61 for valve materials for potable-water service.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Prepare valves for shipping as follows:
  1. Protect internal parts against rust and corrosion.
  2. Protect threads, flange faces, grooves, and weld ends.
  3. Set angle, gate, and globe valves closed to prevent rattling.
  4. Set ball and plug valves open to minimize exposure of functional surfaces.
  5. Set butterfly valves closed or slightly open.
  6. Block check valves in either closed or open position.
- 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.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Crane Co.; Crane Valve Group; Crane Valves.
    - b. Grinnell Corporation.
    - c. Hammond Valve.
    - d. Milwaukee Valve Company.
    - e. NIBCO INC.
    - f. Red-White Valve Corp.
    - g. Watts Industries, Inc.; Water Products Div.

### **2.2 VALVES, GENERAL**

- A. Refer to Part 3 "Valve Applications" Article for applications of valves.
- B. Bronze Valves: NPS 2 (DN 50) and smaller with threaded ends, unless otherwise indicated.
- C. Ferrous Valves: NPS 2-1/2 (DN 65) and larger with flanged ends, unless otherwise indicated.

- D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- E. Valve Sizes: Same as upstream pipe, unless otherwise indicated.
- F. Valve Actuators:
  - 1. Handwheel: For valves other than quarter-turn types.
  - 2. Lever Handle: For quarter-turn valves NPS 6 (DN 150) and smaller, except plug valves.
- G. Extended Valve Stems: On insulated valves.
- H. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.
- I. Valve Grooved Ends: AWWA C606.
  - 1. Solder Joint: With sockets according to ASME B16.18.
    - a. Caution: Use solder with melting point below 840 deg F (454 deg C) for angle, check, gate, and globe valves; below 421 deg F (216 deg C) for ball valves.
  - 2. Threaded: With threads according to ASME B1.20.1.
- J. Valve Bypass and Drain Connections: MSS SP-45.

### **2.3 COPPER-ALLOY BALL VALVES**

- A. Copper-Alloy Ball Valves, General: MSS SP-110.
- B. One-Piece, Copper-Alloy Ball Valves: Brass or bronze body with chrome-plated bronze ball, PTFE or TFE seats, and 400-psig (2760-kPa) minimum] [600-psig (4140-kPa)] CWP rating.
- C. Two-Piece, Copper-Alloy Ball Valves: Brass or bronze body with full-port, chrome-plated bronze ball; PTFE seats; and 600-psig (4140-kPa) minimum CWP rating and blowout-proof stem.

### **2.4 BRONZE CHECK VALVES**

- A. Bronze Check Valves, General: MSS SP-80.
- B. Type 1, Class 150, Bronze, Horizontal Lift Check Valves: Bronze body with bronze disc and seat.
- C. Type 1, Class 150, Bronze, Vertical Lift Check Valves: Bronze body with bronze disc and seat.

### **2.5 BRONZE GATE VALVES**

- A. Bronze Gate Valves, General: MSS SP-80, with ferrous-alloy handwheel.
- B. Type 1, Class 125, Bronze Gate Valves: Bronze body with nonrising stem and bronze solid wedge and union-ring bonnet.

## **2.6 CAST-IRON GATE VALVES**

- A. Cast-Iron Gate Valves, General: MSS SP-70, Type I.
- B. Class 125, NRS, Bronze-Mounted, Cast-Iron Gate Valves: Cast-iron body with bronze trim, nonrising stem, and solid-wedge disc.
- C. Class 125, OS&Y, Bronze-Mounted, Cast-Iron Gate Valves: Cast-iron body with bronze trim, rising stem, and solid-wedge disc.

## **2.7 CAST-IRON PLUG VALVES**

- A. Cast-Iron Plug Valves, General: MSS SP-78.
- B. Class 125 or 150, lubricated-type, cast-iron plug valves.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. 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.
- C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- D. Examine threads on valve and mating pipe for form and cleanliness.
- E. 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.
- F. Do not attempt to repair defective valves; replace with new valves.

### **3.2 VALVE APPLICATIONS**

- A. Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:
  - 1. Shutoff Service: Ball, butterfly, gate, or plug valves.
  - 2. Throttling Service: Ball, butterfly, or globe valves.
  - 3. Pump Discharge: Swing check, lift-disc check valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

- C. Chilled-Water Piping: Use the following types of valves:
  1. Ball Valves, NPS 2 (DN 50) and Smaller: Two-piece, 400-psig (2760-kPa) CWP rating, copper alloy.
  2. Butterfly Valves, NPS 2-1/2 (DN 65) and Larger: Flanged, [150-psig (1035-kPa)] [175-psig (1207-kPa)] CWP rating, ferrous alloy, with EPDM liner.
  3. Grooved-End, Ductile-Iron Butterfly Valves, NPS 2-1/2 (DN 65) and Larger: 175-psig (1207-kPa) CWP rating.
  
- D. Domestic Water Piping: Use the following types of valves:
  1. Ball Valves, NPS 2 (DN 50) and Smaller: Two-piece, [400-psig (2760-kPa)]CWP rating, copper alloy.
  2. Ball Valves, NPS 2-1/2 (DN 65) and Larger: Class 150, ferrous alloy.
  3. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 4, Class [125] [150], bronze.
  4. Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, gray iron.
  5. Gate Valves, NPS 2 (DN 50) and Smaller: Type [1] [2], Class 150] , bronze.
  6. Gate Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, bronze-mounted cast iron.

## CONTROL VALVES

1. Calibrated Balancing Valves and Automatic Flow-Control Valves shall not be required on devices where pressure independent control valves are installed.

### 3.3 VALVE INSTALLATION

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- C. Locate valves for easy access and provide separate support where necessary.
- D. Install valves in horizontal piping with stem at or above center of pipe.
- E. Install valves in position to allow full stem movement.

### 3.4 JOINT CONSTRUCTION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

**END OF SECTION**

**SECTION 15140  
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 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes domestic water piping from locations indicated to fixtures and equipment inside the building.
- B. Related Sections include the following:
  - 1. Division 15 Section "Plumbing Specialties" for water distribution piping specialties.
- C. PVC: Polyvinyl chloride plastic.

**1.3 PERFORMANCE REQUIREMENTS**

- A. Provide components and installation capable of producing domestic water piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
  - 1. Domestic Water Distribution Piping: 125 psig (860 kPa).

**1.4 SUBMITTALS**

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

**1.5 QUALITY ASSURANCE**

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic, potable domestic water piping and components.
- C. Comply with NSF 61, "Drinking Water System Components-Health Effects; Sections 1 through 9," for potable domestic water piping and components.

**PART 2 - PRODUCTS**

**2.1 PIPING MATERIALS**

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.
- B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- C. Transition Couplings for Underground Pressure Piping: AWWA C219, metal, sleeve-type coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

**2.2 COPPER TUBING**

- A. Hard Copper Tube: ASTM B 88, Types K and L, water tube, drawn tempered.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
4. Copper, Grooved-End Fittings: ASTM B 75 (ASTM B 75M) copper tube or ASTM B 584 bronze castings.
  - a. Copper-Tubing, Keyed Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, gasket suitable for hot water, and bolts and nuts.

## **2.4 VALVES**

- A. Refer to Division 15 Section "Valves" for bronze and cast-iron, general-duty valves.
- B. Refer to Division 15 Section "Plumbing Specialties" for balancing and drain valves.

## **PART 3 - EXECUTION**

### **3.1 EXCAVATION**

- A. Refer to Division 2 for excavating, trenching, and backfilling.

### **3.2 PIPING APPLICATIONS**

- 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 may be used on aboveground piping, unless otherwise indicated.
- C. Grooved joints may be used on aboveground grooved-end piping.
- D. Fitting Option: Mechanically formed tee-branch outlets and brazed joints may be used on aboveground copper tubing.
- E. Aboveground Domestic Water Piping: Use the following piping materials for each size range:
  1. NPS 4 (DN 40) and Smaller: Hard copper tube, Type L; copper pressure fittings; and soldered joints.
- F. Underground Domestic Water Piping NPS 4 (DN 100) and Smaller: Hard copper tube, Type K; copper pressure fittings; and soldered joints. Water service larger than NPS 4 shall be PVC.

### **3.3 VALVE APPLICATIONS**

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  1. Shutoff Duty: Use bronze ball or gate valves for piping NPS 2 (DN 50) and smaller. Use cast-iron butterfly or gate valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
  2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 (DN 50) and smaller. Use cast-iron butterfly valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
  3. Hot-Water-Piping, Balancing Duty: Calibrated balancing valves.
  4. Drain Duty: Hose-end drain valves.
- B. Cast-iron, grooved-end valves may be used with grooved-end piping.

### **3.4 PIPING INSTALLATION**

- A. Refer to Division 2 for site water distribution and service piping.

- B. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.
- C. Extend domestic water service piping to exterior water distribution piping in sizes and locations indicated.
- D. Install underground copper tubing according to CDA's "Copper Tube Handbook."
- E. Install underground PVC piping according to ASTM D 2774 and ASTM F 645. Install buried piping inside building between wall and floor penetrations and connection to water service piping outside building with restrained joints. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.
- F. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for sleeves and mechanical sleeve seals.
- G. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for wall penetration systems.
- H. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside building at each domestic water service. Refer to Division 15 Section "Meters and Gages" for pressure gages, and to Division 15 Section "Plumbing Specialties" for drain valves and strainers.
- I. Install water-pressure regulators downstream from shutoff valves. Refer to Division 15 Section "Plumbing Specialties" for water-pressure regulators.
- J. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.
- K. Perform the following steps before operation:
  1. Close drain valves, hydrants, and hose bibbs.
  2. Open shutoff valves to fully open position.
  3. Open throttling valves to proper setting.
  4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
- L. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.

### **3.5 JOINT CONSTRUCTION**

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.
- C. Grooved Joints: Assemble joints with keyed-coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- D. Mechanically Formed Outlets: Form tee in copper tube according to equipment manufacturer's written instructions. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

### **3.6 VALVE INSTALLATION**

- A. Install shutoff valve on each water supply to equipment and on each water supply to plumbing fixtures without supply stops. Use ball or gate valves for piping NPS 2 (DN 50) and smaller. Use butterfly or gate valves for piping NPS 2-1/2 (DN 65) and larger.
- B. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop flow. Refer to Division 15 Section "Plumbing Specialties" for calibrated balancing valves.

### **3.7 HANGER AND SUPPORT INSTALLATION**

- A. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:
  - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
  - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
    - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.
  - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install supports according to Division 15 Section "Hangers and Supports."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch (10 mm).
- E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod
  - 2. NPS 1 and NPS-1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10mm) Rod.
  - 3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10mm) rod.
  - 4. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13 mm) rod.
  - 5. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet (3 m) with 1/2-inch (13 mm) rod.
  - 6. NPS 6 (DN 150): 10 feet (3 m) with 5/8-inch (16-mm) rod.
  - 7. NPS 8 (DN 200): 10 feet (3 m) with 3/4-inch (19-mm) rod.
- G. Install supports for vertical copper tubing every 10 feet (3m).

### **3.8 CONNECTIONS**

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment and machines to allow service and maintenance.
- C. Connect domestic water piping to exterior water service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to service piping with shutoff valve, and extend and connect to the following:

1. Water Heaters: Cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
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 (DN 65) and larger.

### **3.9 FIELD QUALITY CONTROL**

#### **A. Inspect domestic water piping as follows:**

1. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
2. 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:
  - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  - b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

#### **B. Test domestic water piping 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 domestic water piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
4. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

### **3.10 ADJUSTING**

#### **A. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.**

1. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
2. Adjust calibrated balancing valves to flows indicated.

### **3.11 CLEANING**

#### **A. Clean and disinfect potable domestic water piping as follows:**

1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.
  2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as 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 (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
      - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.
    - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- B. Prepare and submit reports of purging and disinfecting activities.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

**END OF SECTION**

**SECTION 15150  
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 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes soil and waste, sanitary drainage and vent piping inside the building and to locations indicated.
- B. Related Sections include the following:
  - 1. Division 15 Section "Plumbing Specialties" for soil, waste, and vent piping systems specialties.

**1.3 DEFINITIONS**

- A. The following are industry abbreviations for plastic piping materials:
  - 1. PVC: Polyvinyl chloride plastic.

**1.4 PERFORMANCE REQUIREMENTS**

- A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
  - 1. Soil, Waste, and Vent Piping: 10-foot head of water (30 kPa).

**1.5 SUBMITTALS**

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Shop Drawings: For solvent drainage system, include plans, elevations, sections, and details.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

**1.6 QUALITY ASSURANCE**

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

**PART 2 - PRODUCTS**

## **2.1 PIPING MATERIALS**

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.
- B. Flexible Transition Couplings for Underground Nonpressure Piping: ASTM C 1173 with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.

## **2.2 PVC PIPING**

- A. PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.
  - 1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.
- B. PVC Special Fittings: ASTM F 409, drainage-pattern tube and tubular fittings with ends as required for application.

## **PART 3 - EXECUTION**

### **3.1 EXCAVATION**

- A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

### **3.2 PIPING APPLICATIONS**

- A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground pressure piping, unless otherwise indicated.
- C. Aboveground, Soil, Waste, and Vent Piping: Use the following piping materials for each size range:
  - 1. NPS 1-1/4 and NPS 1-1/2 (DN 32 and DN 40): PVC pipe, PVC socket fittings, and solvent-cemented joints.
  - 2. NPS 2 to NPS 4 (DN 50 to DN 100): PVC pipe, PVC socket fittings, and solvent-cemented joints.
  - 3. NPS 5 and NPS 6 (DN 125 and DN 150): Use NPS 6 (DN 150) PVC pipe, PVC socket fittings, and solvent-cemented joints.
- D. Underground, Soil, Waste, and Vent Piping: Use the following piping materials for each size range:
  - 1. NPS 2 to NPS 4 (DN 50 to DN 100): PVC pipe, PVC socket fittings, and solvent-cemented joints.
  - 2. NPS 5 and NPS 6 (DN 125 and DN 150): PVC pipe, PVC socket fittings, and solvent-cemented joints.

### **3.3 PIPING INSTALLATION**

- A. Refer to Division 2 Section "Sanitary Sewerage" for Project-site sanitary sewer piping.
- B. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.
- C. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
- D. Install cleanout fitting with closure plug inside the building in sanitary force-main piping.
  - 1. Encase piping with PE film according to ASTM A 674 or AWWA C105.
- E. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for sleeves and mechanical sleeve seals.
- F. 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  $\frac{1}{4}$  bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8- bend fittings if 2 fixture 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.
- G. 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.
- H. Re-verify building drainage piping slope before covering pipe in trench if left uncovered over a 24 hour period of subjected to exterior water. If slope of piping has changed, provide new shoring material to maintain original slope after trench has been covered.
- I. Install soil and waste drainage and vent piping at the code required minimum slopes, unless otherwise indicated:
- J. Install engineered soil and waste drainage and vent piping systems in locations indicated and as follows:
  - 1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
  - 2. Cast-Iron, Sovent, Single Stack: Comply with ASSE 1043 and sovent fitting manufacturer's written installation instructions.
  - 3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.
- K. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- L. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.
- M. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

- N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

### **3.4 JOINT CONSTRUCTION**

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

### **3.5 HANGER AND SUPPORT INSTALLATION**

- A. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:
  - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
  - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
    - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.
  - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install supports according to Division 15 Section "Hangers and Supports."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.
- J. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
  - 2. NPS 3 (DN 80): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
  - 3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
  - 4. NPS 6 (DN 150): 48 inches (1200 mm) with 3/4-inch (19-mm) rod.
  - 5. NPS 8 to NPS 12 (DN 200 to DN 300): (1200 mm) with 7/8-inch (22-mm) rod.
- K. Install supports for vertical PVC piping every 48 inches (1200 mm).
- L. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### **3.6 CONNECTIONS**

- A. Drawings indicate general arrangement of piping, fittings, and specialties.

- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
  1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
  2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
  3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Specialties."
  4. 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 (DN 65) and larger.

### **3.7 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 (30 kPa). 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 (250 Pa). 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.

### **3.8 CLEANING**

- 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.

**END OF SECTION**

## SECTION 15190

### SYSTEM IDENTIFICATION AND PIPE MARKING

#### PART 1 - GENERAL

##### 1.01 GENERAL REQUIREMENTS

- A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.
- B. The Basic Materials and Methods, Section 15050, are included as a part of this Section as though written in full in this document.

##### 1.02 SCOPE

Scope of the Work shall include the furnishing and complete installation of the equipment covered by this Section, with all auxiliaries, ready for owner's use.

- 1.03 Refer to Architectural Sections for additional requirements.

#### PART 2 - PRODUCTS

##### 2.01 VALVE AND PIPE IDENTIFICATION

###### A. Valves:

1. All valves shall be identified with a 1-1/2" diameter brass disc wired onto the handle. The disc shall be stamped with 1/2" high depressed black filled identifying numbers. These numbers shall be numerically sequenced for all valves on the job.
2. The number and description indicating make, size, model number and service of each valve shall be listed in proper operational sequence, properly typewritten. Three copies to be turned over to Owner at completion.
3. Tags shall be fastened with approved meter seal and 4 ply 0.018 smooth copper wire. Tags and fastenings shall be manufactured by the Seton Name Plate Company or approved equal.
4. All valves shall be numbered serially with all valves of any one system and/or trade grouped together.

###### B. Pipe Marking:

1. All interior visible piping located in accessible spaces such as above accessible ceilings, equipment rooms, attic space, under floor spaces, etc., shall be identified with all temperature pipe markers as manufactured by W.H. Brady Company, 431 West Rock Ave., New Haven, Connecticut, or approved equal.
2. All exterior visible piping shall be identified with UV and acid resistant outdoor grade acrylic plastic markers as manufactured by Set Mark distributed by Seton nameplate company. Factory location 20 Thompson Road, Branford, Connecticut, or approved equal.
3. Generally, markers shall be located on each side of each partition, on each side

of each tee, on each side of each valve and/or valve group, on each side of each piece of equipment, and, for straight runs, at equally spaced intervals not to exceed 75 feet. In congested area, marks shall be placed on each pipe at the points where it enters and leaves the area and at the point of connection of each piece of equipment and automatic control valve. All markers shall have directional arrows.

4. Markers shall be installed after final painting of all piping and equipment and in such a manner that they are visible from the normal maintenance position. Manufacturer's installation instructions shall be closely followed.
5. Markers shall be colored as indicated below per ANSI/OSHA Standards:

<u>SYSTEM</u>	<u>COLOR</u>	<u>LEGEND</u>
Chilled Water	Green	Chilled Water Supply Chilled Water Return
Sanitary Sewer	Green	Vent Sanitary Sewer
Storm Drain	Green	Storm Drain
Domestic Water	Green	Domestic Water
Domestic Hot Water Supply	Yellow	Domestic Hot Water Supply
Domestic Hot Water Recirculating	Yellow	Domestic Hot Water Return
Fire Protection	Red	Fire Protection
Automatic Sprinkler	Red	Fire Sprinkler
Gas	Yellow	Natural Gas
Condenser Water	Green	Condenser Water Supply Condenser Water Return
Compressed Air	Blue	Compressed Air
Pneumatic Control	Yellow	Pneumatic Controls
Oxygen	Yellow	Oxygen
Nitrogen	Green	Nitrogen
Deionized Water	Green	Deionized Water
Steam	Yellow	Steam Supply Steam Return

C. Pipe Painting:

1. All piping exposed to view shall be painted as indicated or as directed by the Architect in the field. Confirm all color selections with Architect prior to installation.
2. The entire fire protection piping system shall be painted red.
3. All piping located in mechanical rooms and exterior piping shall be painted as indicated below:

<u>System</u>	<u>Color</u>
Storm Sewer	White
Sanitary Sewer Waste and Vent	Light Gray
Domestic Cold Water	Dark Blue
Domestic Hot Water Supply and Return	Orange
Condenser Water Supply and Return	Light Green
Gas	Yellow
Chilled Water Supply and Return	Light Blue
Heating Hot Water Supply and Return	Reddish Orange

### PART 3 - EXECUTION

- 3.01 All labeling equipment shall be installed as per manufacturers printed installation instructions.
- 3.02 All items required for a complete and proper installation are not necessarily indicated on the plans or in the specifications. Contractors price shall include all items required as per manufacturers' requirements.
- 3.03 All piping shall be cleaned of rust, dirt, oil and all other contaminants prior to painting. Install primer and a quality latex paint over all surfaces of pipe.

**END OF SECTION**

**SECTION 15410  
PLUMBING FIXTURES**

**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 plumbing fixtures and related components.
- B. Related Sections include the following:
  - 1. Division 15 Section "Drinking Fountains and Water Coolers."
  - 2. Division 15 Section "Plumbing Specialties" for backflow preventers and specialty fixtures not in this Section.

**1.3 DEFINITIONS**

- A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
- B. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

**1.4 SUBMITTALS**

- A. Product Data: Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated.

**1.5 QUALITY ASSURANCE**

- A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
  - 1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.
- B. Regulatory Requirements: Comply with requirements in U.S. Architectural & Transportation Barriers Compliance Board's "Uniform Federal Accessibility Standards (UFAS), 1985-494-187" about plumbing fixtures for people with disabilities.

- C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- E. TAS: Texas Accessibility Standards.

## **1.6 COORDINATION**

- A. Coordinate roughing-in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. For fixture descriptions in other Part 2 articles where the subparagraph titles "Products," and "Manufacturers" introduce a list of manufacturers and their products or manufacturers only, the following requirements apply for product selection:
  - 1. Products: Subject to compliance with requirements, provide one of the products specified in other Part 2 articles.

### **2.2 LAVATORY FAUCETS**

- A. Lavatory Faucet: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.
  - 1. Products:
    - a. American Standard.
    - b. Eljer.
    - c. Kohler.

### **2.3 SHOWER FAUCETS**

- A. Shower Faucet: Include hot- and cold-water indicators; tub spout; and shower head, arm, and flange. Coordinate faucet inlets with supplies and outlet with diverter valve.
  - 1. Manufacturers:
    - a. American Standard.
    - b. Eljer.
    - c. Kohler.

### **2.4 SINK FAUCETS**

- A. Sink Faucet: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.
  - 1. Manufacturers:

- a. American Standard.
- b. Eljer
- c. Kohler.

## **2.5 TOILET SEATS**

- A. Toilet Seat: Solid plastic.
  - 1. Manufacturers:
    - a. Bemis.
    - b. Beneke.
    - c. Centoco.
    - d. Church.

## **2.6 PROTECTIVE SHIELDING GUARDS**

- A. Protective Shielding Guard, Manufactured, plastic enclosure for covering for hot- and cold-water supplies and trap and drain piping and complying with ADA requirements.
  - 1. Manufacturers:
    - a. Engineered Brass Co.
    - b. Plumerex
    - c. Truebro.

## **2.7 FIXTURE SUPPORTS**

- A. Water-Closet Support: Water-closet combination carrier designed for accessible and standard mounting heights. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.
  - 1. Manufacturers:
    - a. Mifab
    - b. Josam.
    - c. Wade.
    - d. Zurn
  
- B. Urinal Support: Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include steel uprights with feet.
  - 1. Manufacturers:
    - a. Josam.
    - b. J.R. Smith
    - c. Zurn.
  
  - 2. Accessible Fixture Support: Include rectangular steel uprights.
  
- C. Lavatory Support: Type II, lavatory carrier with concealed arms and tie rod. Include steel uprights with feet.
  - 1. Manufacturers:

- a. Josam.
  - b. J.R. Smith
  - c. Zurn.
- 2. Accessible Fixture Support: Include rectangular steel uprights.
- D. Sink Support: Type II, sink carrier with hanger plate, bearing studs, and tie rod. Include steel uprights with feet.
  - 1. Manufacturers:
    - a. Josam.
    - b. J.R. Smith
    - c. Zurn.

## **2.8 WATER CLOSETS**

- A. Water Closets: Accessible, wall-hanging, back-outlet, vitreous-china fixture designed for flushometer valve operation.
  - 1. Products:
    - a. American Standard, Inc.
    - b. Kohler Co.
    - c. TOTO USA, Inc.
- B. Water Closets: Accessible, floor mounting, floor-outlet, vitreous-china fixture designed for flushometer valve operation.
  - 1. Products:
    - a. American Standard, Inc.
    - b. Kohler Co.
    - c. TOTO USA, Inc.

## **2.9 URINALS**

- A. Urinals,: Accessible, wall-hanging, back-outlet, vitreous-china fixture designed for flushometer valve operation.
  - 1. Products:
    - a. American Standard, Inc.
    - b. Kohler Co.
    - c. TOTO USA, Inc.

## **2.10 LAVATORIES, SINKS**

- A. Lavatories,: Accessible, wall hanging, vitreous-china fixture.
  - 1. Products:
    - a. American Standard, Inc.
    - b. Kohler Co.
    - c. Toto

## **2.11 KITCHEN SINKS**

- A. Kitchen Sinks: Commercial, counter-mounting, stainless-steel fixture.
  - 1. Products:
    - a. Elkay Manufacturing Co.
    - b. Just Manufacturing Co.

## **2.12 SERVICE SINKS**

- A. Service Sinks: Floor-mounting, enameled, sink with front apron, raised back, and coated, wire rim guard.
  - 1. Products:
    - a. Commercial Enameling Co.
    - b. Kohler Co.
    - c. Fiat

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine roughing-in for water soil and for waste piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Use manufacturer's roughing-in data if roughing-in data are not indicated.
- B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 FIXTURE INSTALLATION**

- A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. For wall-hanging fixtures, install off-floor supports affixed to building substrate.
  - 1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
  - 2. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
- C. Install back-outlet, wall-hanging fixtures onto waste fitting seals and attach to supports.
- D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
- E. Install wall-hanging fixtures with tubular waste piping attached to supports.
- F. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

- G. Install counter-mounting fixtures in and attached to casework.
- H. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.
- I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
  - 1. Exception: Use ball, gate, or globe valve if stops are not specified with fixture. Refer to Division 15 Section "Valves" for general-duty valves.
- J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- K. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
- L. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.
- M. Install toilet seats on water closets.
- N. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- O. Install water-supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.
- P. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- Q. Install traps on fixture outlets.
- R. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for escutcheons.
- S. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Division 7 Section "Joint Sealants" for sealant and installation requirements.

### **3.3 CONNECTIONS**

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect water supplies from water distribution piping to fixtures.
- C. Connect drain piping from fixtures to drainage piping.

- D. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.
- E. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.
- F. Ground equipment.
  - 1. 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. Verify that installed fixtures are categories and types specified for locations where installed.
- B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

### **3.5 ADJUSTING**

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at faucets, shower valves, and flushometer valves to produce proper flow and stream.
- C. Replace washers and seals of leaking and dripping faucets and stops.

### **3.6 CLEANING**

- A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:
  - 1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
  - 2. Remove sediment and debris from drains.

### **3.7 PROTECTION**

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

**END OF SECTION**

**SECTION 15415  
DRINKING FOUNTAINS AND WATER COOLERS**

**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. Drinking fountains.
  - 2. Self-contained water coolers.
  - 3. Fixture supports.

**1.3 DEFINITIONS**

- A. Accessible Drinking Fountain and Water Cooler: Fixture that can be approached and used by people with disabilities.
- B. Drinking Fountain: Fixture with nozzle for delivering stream of water for drinking.
- C. Fitting: Device that controls flow of water into or out of fixture.
- D. Fixture: Drinking fountain or water cooler, unless one is specifically indicated.
- E. Water Cooler: Electrically powered fixture for generating and delivering cooled drinking water.

**1.4 SUBMITTALS**

- A. Product Data: Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories for each type of fixture indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.
- C. Maintenance Data: For fixtures to include in maintenance manuals specified in Division 1.

**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. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities" about fixtures for people with disabilities.
- C. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- D. ARI Standard: Comply with ARI 1010, "Self-Contained, Mechanically Refrigerated Drinking-Water Coolers," for water coolers and with ARI's "Directory of Certified Drinking Water Coolers" for type and style classifications.
- E. TAS: Texas Accessibility Standards.

## **1.6 COORDINATION**

- A. Coordinate roughing-in and final fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified below.
  1. Elkay.
  2. Halsey Taylor.
  3. Haws Corporation.

### **2.2 DRINKING FOUNTAINS**

- A. Drinking Fountains,: Accessible, Style W, wall-hanging fixture made of stainless steel.
  1. Receptor Shape: Rectangular.
  2. Back Panel: Stainless-steel wall plate behind drinking fountain.
  3. Bubblers: Two, with automatic stream regulator, located on deck.
  4. Control: Push button.
  5. Supply: NPS 3/8 (DN 10) with ball, gate, or globe valve.
  6. Drain: Grid with NPS 1-1/4 (DN 32) minimum horizontal waste and trap complying with ASME Standards.
  7. Support: Type I, water-cooler carrier. Refer to "Fixture Supports" Article.

### **2.3 SELF-CONTAINED WATER COOLERS**

- A. Water Coolers: Accessible, ARI 1010, Type PB, pressure with bubbler, Style W, wall-hanging fixture.
  1. Cabinet: Bilevel with two attached cabinets, enameled steel with stainless-steel top.
  2. Bubbler: One, with automatic stream regulator, located on each cabinet deck.
  3. Control: Push button.
  4. Supply: NPS 3/8 (DN 10) with ball, gate, or globe valve and filter.

5. Drain: Grid with NPS 1-1/4 (DN 32) minimum horizontal waste and trap complying with ASME Standards.
6. Cooling System: Electric, with hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.
  - a. Capacity: 8 gph (0.0084 L/s) of 50 deg F (10 deg C) cooled water from 80 deg F (27 deg C) inlet water and 90 deg F (32 deg C) ambient air temperature.
  - b. Electrical Characteristics: 1/5 hp; 120-V ac; single phase; 60 Hz.
7. Support: Type II, water-cooler carrier. Refer to "Fixture Supports" Article.

## **2.4 FIXTURE SUPPORTS**

- A. Off-Floor, Plumbing Fixture Supports: ASME A112.6.1M, water-cooler carriers. Include vertical, steel uprights with feet and tie rods and bearing plates with mounting studs matching fixture to be supported.
  1. Available Manufacturers:
  2. Manufacturers:
    - a. Josam Co.
    - b. Smith, Jay R. Mfg. Co.
    - c. Tyler Pipe; Wade Div.
    - d. Zurn Specifications Drainage Operation.
  3. Type I: Hanger-type carrier with two vertical uprights.
  4. Type II: Bilevel, hanger-type carrier with three vertical uprights.
  5. Supports for Accessible Fixtures: Include rectangular, vertical, steel uprights instead of steel pipe uprights.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine roughing-in for water and waste piping systems to verify actual locations of piping connections before fixture installation. Verify that sizes and locations of piping and types of supports match those indicated.
- B. Examine walls and floors for suitable conditions where fixtures are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 APPLICATIONS**

- A. Use carrier off-floor supports for wall-hanging fixtures, unless otherwise indicated.
- B. Use chrome-plated brass or copper tube, fittings, and valves in locations exposed to view. Plain copper tube, fittings, and valves may be used in concealed locations.

### **3.3 INSTALLATION**

- A. Install off-floor supports affixed to building substrate and attach wall-hanging fixtures, unless otherwise indicated.
- B. Install mounting frames affixed to building construction and attach recessed water coolers to mounting frames, unless otherwise indicated.
- C. Install fixtures level and plumb.
- D. Install water-supply piping with shutoff valve on supply to each fixture to be connected to water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation. Refer to Division 15 Section "Valves" for general-duty valves.
- E. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.
- F. Install pipe escutcheons at wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding pipe fittings. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for escutcheons.
- G. Seal joints between fixtures and walls and floors using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Division 7 for sealant and installation requirements.

### **3.4 CONNECTIONS**

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect water supplies from water distribution piping to fixtures.
- C. Connect drain piping from fixtures to drainage piping.
- D. Ground equipment.
  - 1. 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.

**END OF SECTION**

**SECTION 15430  
PLUMBING SPECIALTIES**

**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 plumbing specialties:
  1. Balancing valves.
  2. Washer-supply outlets.
  3. Key-operation hydrants.
  4. Trap seal primer valves.
  5. Drain valves.
  6. Miscellaneous piping specialties.
  7. Sleeve penetration systems.
  8. Flashing materials.
  9. Cleanouts.
  10. Floor drains.
  11. Roof drains.
  12. Grease interceptors.

**1.3 DEFINITIONS**

- A. The following are industry abbreviations for plastic piping materials:
  1. ABS: Acrylonitrile-butadiene-styrene plastic.
  2. PVC: Polyvinyl chloride plastic.

**1.4 PERFORMANCE REQUIREMENTS**

- A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:
  1. Domestic Water Piping: 125 psig (860 kPa).
  2. Sanitary Waste and Vent Piping: 10-foot head of water (30 kPa).
  3. Storm Drainage Piping: 10-foot head of water (30 kPa).

**1.5 SUBMITTALS**

- A. Product Data: Include rated capacities and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following:
  1. Balancing valves.

2. Water hammer arresters, and trap seal primer valves and systems.
3. Hose bibbs, hydrants.
4. Washer-supply outlets.
5. Cleanouts, floor drains, and roof drains.
6. Roof flashing assemblies.
7. Grease interceptors.
8. Sleeve penetration systems.

B. Shop Drawings: Diagram power, signal, and control wiring.

## **1.6 QUALITY ASSURANCE**

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of plumbing specialties and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- B. Plumbing specialties shall bear label, stamp, or other markings of specified testing agency.
- C. 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.
- D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for piping materials and installation.
- E. NSF Compliance:
  1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components. Include marking "NSF-pw" on plastic potable-water piping and "NSF-dwv" on plastic drain, waste, and vent piping.
  2. Comply with NSF 61, "Drinking Water System Components--Health Effects, Sections 1 through 9," for potable domestic water plumbing specialties.

## **PART 2 - PRODUCTS**

### **2.1 BALANCING VALVES**

- A. Calibrated Balancing Valves: Adjustable, with two readout ports and memory setting indicator. Include manufacturer's standard hoses, fittings, valves, differential pressure meter, and carrying case.
  1. Manufacturers:
    - a. Armstrong Pumps, Inc.
    - b. Flow Design, Inc.
    - c. ITT Industries; Bell & Gossett Div.
    - d. Taco, Inc.
    - e. Watts Industries, Inc.; Water Products Div.
  2. NPS 2 (DN 50) and Smaller: Bronze body with brass ball, adjustment knob, calibrated nameplate, and threaded or solder-joint ends.
  3. NPS 2 (DN 50) and Smaller: Bronze, Y-pattern body with adjustment knob and threaded ends.

4. NPS 2-1/2 (DN 65) and Larger: Cast-iron, Y-pattern body with bronze disc and flanged or grooved ends.
- B. Memory-Stop Balancing Valves, NPS 2 (DN 50) and smaller: MSS SP-110, ball valve, rated for 400-psig (2760-kPa) minimum CWP. Include two-piece, copper-alloy body with full-port, chrome-plated brass ball, replaceable seats and seals, threaded or solder-joint ends, and vinyl-covered steel handle with memory-stop device.
1. Manufacturers:
  - a. Conbraco Industries, Inc.
  - b. Crane Co., Crane Valve Group; Crane Valves.
  - c. Grinnell Corporation.
  - d. NIBCO INC.
  - e. Red-White Valve Corp.

## 2.2 STRAINERS

- A. Strainers: Y-pattern, unless otherwise indicated, and full size of connecting piping. Include ASTM A 666, Type 304, stainless-steel screens with 3/64-inch (1.2-mm) round perforations, unless otherwise indicated.
  1. Pressure Rating: 125-psig (860-kPa) minimum steam working pressure, unless otherwise indicated.
  2. NPS 2 (DN 50) and Smaller: Bronze body, with female threaded ends.
  3. NPS 2-1/2 (DN 65) and Larger: Cast-iron body, with interior AWWA C550 or FDA-approved, epoxy coating and flanged ends.

## 2.3 OUTLET BOXES

- A. Manufacturers:
  1. Acorn Engineering Company.
  2. Gray, Guy Manufacturing Co., Inc.
  3. Symmons Industries, Inc.
- B. General: Recessed-mounting outlet boxes with supply fittings complying with ASME A112.18.1M. Include box with faceplate, services indicated for equipment connections, and wood-blocking reinforcement.
- C. Clothes Washer Outlet Boxes: With hot- and cold-water hose connections, drain, and the following:
  1. Box and Faceplate: [Stainless steel] [Enameled or epoxy-painted steel].
  2. Shutoff Fitting: Two hose bibbs.
  3. Supply Fittings: Two NPS 1/2 (DN 15) gate, globe, or ball valves and NPS 1/2 (DN 15) copper, water tubing.
  4. Drain: NPS 2 (DN 50) standpipe, P-trap, and direct waste connection to drainage piping.
  5. Inlet Hoses: Two ASTM D 3571, 60-inch- (1500-mm-) long, rubber household clothes washer inlet hoses with female hose-thread couplings.
  6. Drain Hose: One 48-inch- (1200-mm-) long, rubber household clothes washer drain hose with hooked end.

- D. Icemaker Outlet Boxes: With hose connection and the following:
1. Box and Faceplate: Stainless steel.
  2. Shutoff Fitting: Hose bibb.
  3. Supply Fitting: NPS 1/2 (DN 15) gate, globe, or ball valve and NPS 1/2 (DN 15) copper, water tubing.

## 2.4 KEY-OPERATION HYDRANTS

- A. Manufacturers:
1. Josam Co.
  2. Smith, Jay R. Mfg. Co.
  3. Woodford Manufacturing Co.
- B. General: ASME A112.21.3M, key-operation hydrant with pressure rating of 125 psig (860 kPa).
1. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25) threaded or solder joint.
  2. Outlet: ASME B1.20.7, garden-hose threads.
  3. Operating Keys: One with each key-operation hydrant.
- C. Moderate-Climate, Concealed-Outlet Wall Hydrants: ASSE 1019, self-drainable with flush-mounting box with cover, integral nonremovable hose-connection vacuum breaker, and concealed outlet.
1. Classification: Type A, for automatic draining with hose removed or Type B, for automatic draining with hose removed or with hose attached and nozzle closed.
- D. Hot and Cold, Nonfreeze Concealed-Outlet Wall Hydrants: With deep flush-mounting box with cover; hot- and cold-water casings and operating rods to match wall thickness; concealed outlet; wall clamps; and factory- or field-installed, nonremovable and manual drain-type, hose-connection vacuum breaker complying with ASSE 1011.

## 2.5 TRAP SEAL PRIMER VALVES

- A. Supply-Type Trap Seal Primer Valves: ASSE 1018, water-supply-fed type, with the following characteristics:
1. Manufacturers:
    - a. Josam Co.
    - b. MIFAB Manufacturing, Inc.
    - c. Precision Plumbing Products, Inc.
    - d. Smith, Jay R. Mfg. Co.
  2. 125-psig (860-kPa) minimum working pressure.
  3. Bronze body with atmospheric-vented drain chamber.
  4. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.
  5. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.
  6. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

## 2.6 MISCELLANEOUS PIPING SPECIALTIES

- A. Water Hammer Arresters: ASSE 1010 or PDI-WH 201, metal-bellows type with pressurized metal cushioning chamber. Sizes indicated are based on ASSE 1010 or PDI-WH 201, Sizes A through F.
  - 1. Manufacturers:
    - a. Josam Co.
    - b. Smith, Jay R. Mfg. Co.
    - c. Tyler Pipe; Wade Div.
    - d. Zurn Industries, Inc.; Specification Drainage Operation.
- B. Hose Bibbs: Bronze body with replaceable seat disc complying with ASME A112.18.1M for compression-type faucets. Include NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet, of design suitable for pressure of at least 125 psig (860 kPa); integral [or field-installed,] nonremovable, drainable hose-connection vacuum breaker; and garden-hose threads complying with ASME B1.20.7 on outlet.
- C. Roof Flashing Assemblies: Manufactured assembly made of [4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch- (1.6-mm-)] [6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch- (2.4-mm-)] thick, lead flashing collar and skirt extending at least [6 inches (150 mm)] [8 inches (200 mm)] [10 inches (250 mm)] from pipe with galvanized steel boot reinforcement, and counterflashing fitting.
- D. Floor-Drain Inlet Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.
- E. Fixed Air-Gap Fittings: Manufactured cast-iron or bronze drainage fitting with semiopen top with threads or device to secure drainage inlet piping in top and bottom spigot or threaded outlet larger than top inlet. Include design complying with ASME A112.1.2 that will provide fixed air gap between installed inlet and outlet piping.
- F. Stack Flashing Fittings: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
- G. Vent Caps: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and set-screws to secure to vent pipe.
- H. Vent Terminals: Commercially manufactured, shop- or field-fabricated, frost-proof assembly constructed of galvanized steel, copper, or lead-coated copper. Size to provide 1-inch (25-mm) enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.
- I. Expansion Joints: ASME A112.21.2M, assembly with cast-iron body with bronze sleeve, packing gland, and packing; of size and end types corresponding to connected piping.

## **2.7 SLEEVE PENETRATION SYSTEMS**

- A. Manufacturers:
  - 1. ProSet Systems, Inc.
- B. Description: UL 1479, through-penetration firestop assembly consisting of sleeve and stack fitting with firestopping plug.
  - 1. 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.

2. Stack Fitting: ASTM A 48 (ASTM A 48M), gray-iron, hubless-pattern, wye-branch stack fitting with neoprene O-ring at base and gray-iron plug in thermal-release harness in branch. Include PVC protective cap for plug.
  - a. Special Coating: Include corrosion-resistant interior coating on fittings for plastic chemical waste and vent stacks.

## 2.8 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-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.
  2. Vent Pipe Flashing: 3-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.
  3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.
- B. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil (1.01-mm) minimum thickness.
- C. Fasteners: Metal compatible with material and substrate being fastened.
- D. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.
- E. Solder: ASTM B 32, lead-free alloy.
- F. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

## 2.9 CLEANOUTS

- A. Cleanouts: Comply with [ASME A112.36.2M] [ASME A112.3.1] <Insert other>.
  1. Application: [Floor cleanout] [Wall cleanout] [For installation in exposed piping].
  2. Products:
    - a. Josam Co.
    - b. Mifab
    - c. Smith, Jay R. Mfg. Co.
    - d. Tyler Pipe, Wade Div.
    - e. Zurn Industries, Inc., Specification Drainage Operation.

## 2.10 FLOOR DRAINS

- A. Floor Drains.
  1. Products:
    - a. Josam Co.
    - b. Mifab
    - c. Smith, Jay R. Mfg. Co.
    - d. Tyler Pipe, Wade Div.
    - e. Zurn Industries, Inc.

## 2.11 ROOF DRAINS

- A. Roof Drains: Comply with [ASME A112.21.2M] [ASME A112.3.1].
  - 1. Application: Roof drain.
  - 2. Products:
    - a. Josam Co.
    - b. Mifab
    - c. Smith, Jay R. Mfg. Co.
    - d. Tyler Pipe, Wade Div.
    - e. Watts Industries, Inc., Drainage Products Div.
    - f. Zurn Industries, Inc.

## 2.12 GREASE INTERCEPTORS

- A. Grease Interceptors: Comply with PDI-G101.
  - 1. Products:
    - a. American Industrial Precast Products, Inc.
    - b. Brooks Products
    - c. Park Equipment Co.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.
- B. Install pressure regulators with inlet and outlet shutoff valves and balance valve bypass. Install pressure gages on inlet and outlet.
- C. Install strainers on supply side of each control valve, pressure regulator, and solenoid valve.
- D. Install 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.
- E. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.
- F. Install expansion joints on vertical risers, stacks, and conductors if indicated.
- G. 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 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
  - 2. Locate at each change in direction of piping greater than 45 degrees.
  - 3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.

4. Locate at base of each vertical soil and waste stack.
- H. Install cleanout deck plates with top flush with finished floor, for floor cleanouts for piping below floors.
  - I. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.
  - J. Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane.
  - K. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions.
  - L. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch (25-mm) clearance between vent pipe and roof substrate.
  - M. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
    1. Position floor drains for easy access and maintenance.
    2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
      - a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
      - b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
      - c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.
    3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
    4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
  - N. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.
    1. Install roof-drain flashing collar or flange so no leakage occurs between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
    2. Position roof drains for easy access and maintenance.
  - O. Install interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.
    1. Flush with In-Ground Installation: Set unit and extension, if required, with cover flush with finished grade.
    2. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.
  - P. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.
  - Q. Fasten recessed-type plumbing specialties to reinforcement built into walls.

- R. Install wood-blocking reinforcement for wall-mounting and recessed-type plumbing specialties.
- S. Install individual shutoff valve in each water supply to plumbing specialties. Use ball, gate, or globe valve if specific valve is not indicated. Install shutoff valves in accessible locations. Refer to Division 15 Section "Valves" for general-duty ball, butterfly, check, gate, and globe valves.
- T. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

### **3.2 CONNECTIONS**

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Connect plumbing specialties to piping specified in other Division 15 Sections.
- D. Ground equipment.
- E. 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.
- F. Connect plumbing specialties and devices that require power according to Division 16 Sections.
- G. Interceptor Connections: Connect piping, flow-control fittings, and accessories.
  - 1. Grease Interceptors: Connect inlet and outlet to unit, and flow-control fitting and vent to unit inlet piping.

### **3.3 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-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.
- 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 (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
  - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
  - 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) 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 Division 7 Section "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.

### **3.4 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled trap seal primer systems and their installation, including piping and electrical connections. Report results in writing.
  - 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. Remove malfunctioning units, replace with new units, and retest.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

### **3.5 PROTECTION**

- A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

**END OF SECTION**

## SECTION 15781

### ROOFTOP HEATING AND COOLING UNITS ELECTRIC COOLING - ELECTRIC HEAT

#### PART 1 - GENERAL

##### 1.01 GENERAL REQUIREMENTS

- A. The requirements of the General Conditions and Supplementary Conditions apply to all work herein.
- B. The Basic Materials and Methods, Section 15050, are included as a part of this Section as though written in full in this document.

##### 1.02 SCOPE

- A. Scope of the Work shall include the furnishing and complete installation of the equipment covered by this Section, with all auxiliaries, ready for owner's use.

#### PART 2 - PRODUCTS

##### 2.01 ROOFTOP UNIT

- A. Rooftop unit shall be packaged and include electric cooling and electric heat with capacity and steps of cooling and heating as shown on the drawings.
- B. Unit shall be factory-charged and tested, shall be UL-labeled and ARI-certified by Standard 210 and 270, and shall be AGA-certified.
- C. Unit casing shall be heavy-gauge galvanized steel or heavy-gauge aluminum with protective coat of baked enamel. Weatherproof access panels shall be provided for access to all parts requiring service.
- D. Compressor(s) shall be sealed or serviceable hermetic type and shall be resiliently mounted to avoid vibration and noise. Compressor shall be provided with anti-slugging protection, crankcase heater, and time delay on recycling of the compressor. Two internal compressor motor thermal cutouts and a hot gas cutout shall protect the compressor in addition to high-pressure and low-pressure safeties. Standard controls shall permit operation down to 35 deg. F (2 deg. C) and compressor shall be locked out below this temperature.
- E. Condenser fan(s) shall be direct-driven on the shaft of the slow-speed motor, which shall be designed to operate exposed to the weather.
- F. Condenser coils shall have a sub-cooling section.
- G. Refrigerant circuit shall include filter dryer, moisture indicator, sight glass, and gauge ports.
- H. Filter rack shall be provided for filters 2 in. thick and shall filter both outdoor air and return air. See Section 15885 of these Specifications for type of filters and the number of filter changes to be furnished with the equipment.
- I. Evaporator fan shall be quiet-type centrifugal blower, directly connected to an adjustable-speed motor or belt driven with an adjustable-pitch pulley on the motor.

- J. Electric heat section shall be installed in the unit and served by the same power source as the rest of the unit. Only one power feed shall be required for the unit.

## 2.02 ACCESSORY EQUIPMENT

- A. Unit shall be provided with hot gas reheat dehumidification option. Hot gas reheat coil shall be located on the leaving air side of the evaporator coil and fully piped and circuited at the factory. Provide a wall mounted humidity sensor to control activation of the hot gas reheat. Sensor shall be adjustable for humidity levels between 40-60% relative humidity.
- A. Condenser coil guards shall be provided.
- B. Roof mounting frame shall be provided for all units mounted on the floor. Frame shall be approved by the National Roofing Contractors Association. Provide all necessary flashing and counterflashing.
- C. Provide "power saver" dampers and controls to provide "free cooling" from 0 to 100% outdoor air (OA) when the outside air humidity and temperature are acceptable. Provide OA, return air, and relief air dampers in a factory-provided enclosure. All air shall be filtered and bird screen shall be installed.
- D. A solid state enthalpy changeover control shall determine the capability of the outside air to provide free cooling. The control package shall include a differential enthalpy sensor in the return air duct to compare the enthalpy of the outside air and return air and use the air with the lowest enthalpy for free cooling or assisting the mechanical cooling. The cooling control sequence is as follows:
  - 1. The changeover control determines if the outdoor air is suitable for free cooling.
  - 2. The space thermostat determines if cooling is needed in the building. If so:
  - 3. The actuator modulates the outdoor air and return air dampers to maintain the desired mixed air temperature.
  - 4. The second cooling stage of the space thermostat energizes the compressor to assist the economizer if required.
  - 5. If the outdoor air is not suitable for free cooling, the outdoor air damper remains in the minimum ventilation position and the compressor is energized when space cooling is required.
- E. Provide a warm-up thermostat to prevent the OA dampers from opening if the return air temperature is below the set point (65 deg. F) (18 deg. C).
- F. Provide necessary controls for operation of the compressor below the normal temperature of the compressor cutout. Operation shall be permitted down to temperature specified on drawings.
- G. Provide factory-trained service person to check out the system, calibrate the controls, and see that the RTU is operating properly. The service person making the settings shall make a written report to the engineer and the owner with all set points listed for future reference.
- H. Rooftop units mounted on slabs or other fixed locations shall be provided with adapters for end discharge and return to the unit.
- I. Provide thermostat and other controls required to produce the control functions called for.

## 2.03 ACCEPTABLE MANUFACTURERS

- A. Roof top unit shall be the make and model number shown on the schedule on the drawings, or acceptable equivalents are Carrier, Lennox, Trane, or York.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install the curb as required by the job conditions and as recommended by the manufacturer, and install proper flashing and counterflashing. See details on the drawings.
- B. Set the unit in place, taking care to protect the adjacent roofing, and connect the supply and return ductwork.
- C. Make electrical connections, taking care that these do not block access to any part of the equipment requiring service.
- D. Have the factory service person check out the unit and make a written report. Place the unit in service.
- E. Connect full size condensate drain pipe to roof top unit and extend to nearest drain, pipe shall be schedule 40 galvanized with malleable iron fittings.

### 3.02 BALANCING AND TEST

- A. Operate the roof top unit and check for proper supply air quantity, noise, and proper operation.
- B. Report the airflow, static pressure, voltage and current draw of each item, refrigerant pressure readings, etc., as required by Section 15990 of these Specifications. This system is not complete until these readings have been made, submitted to the engineer, and accepted.

**END OF SECTION**

## SECTION 15815

### METAL DUCTS

#### 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 rectangular, round, and flat-oval metal ducts and plenums for heating, ventilating, and air-conditioning systems in pressure classes from minus 2- to plus 10-inch wg
- B. Related Sections include the following:
  - 1. Division 15 Section "Duct Accessories" for dampers, sound-control devices, duct-mounted access doors and panels, turning vanes, and flexible ducts.
  - 2. Division 15 Section "Diffusers, Registers, and Grilles."
  - 3. Division 15 Section "Testing, Adjusting, and Balancing" for air balancing and final adjusting of manual-volume dampers.

##### 1.3 DEFINITIONS

- A. Thermal Conductivity and Apparent Thermal Conductivity (k-Value): As defined in ASTM C 168. In this Section, these values are the result of the formula  $Btu \times in./h \times sq. ft. \times deg F$  or  $W/m \times K$  at the temperature differences specified. Values are expressed as Btu or W.

##### 1.4 SYSTEM DESCRIPTION

- A. Duct system design, as indicated, has been used to select and size air-moving and -distribution equipment and other components of air system. Changes to layout or configuration of duct system must be specifically approved in writing by Architect.

##### 1.5 SUBMITTALS

- A. Product Data: For duct liner and sealing materials.
- B. **Shop Drawings: Show details of the following:**
  - 1. **Duct layout indicating pressure classifications and sizes on plans.**
  - 2. **Fittings.**
  - 3. **Penetrations through fire-rated and other partitions.**
  - 4. **Coordination with other trades and including but not limited to: structural members, electrical lights and conduits, plumbing lines, & fire sprinkler lines.**
- C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
  - 1. Ceiling- and wall-mounted access doors and panels required to provide access to dampers and other operating devices.
  - 2. Coordination with ceiling-mounted items, including lighting fixtures, diffusers, grilles, speakers, sprinkler heads, access panels, and special moldings.

- D. Duct Construction Standards: Provide a copy of the duct construction standards to be used for each pressure classification in this project. Duct Construction Standards must comply with the latest edition of SMACNA "HVAC Duct Construction Standards – Metal and Flexible."
- E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- F. Record Drawings: Indicate actual routing, fitting details, reinforcement, support, and installed accessories and devices.

## **1.6 QUALITY ASSURANCE**

- A. Welding Standards: Qualify welding procedures and welding personnel to perform welding processes for this Project according to AWS D1.1, "Structural Welding Code--Steel," for hangers and supports; AWS D1.2, "Structural Welding Code--Aluminum," for aluminum supporting members; and AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," unless otherwise indicated.
- C. Comply with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems," unless otherwise indicated.
- D. Comply with NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations," Chapter 3, "Duct System," for range hood ducts, unless otherwise indicated.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver sealant and firestopping materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle sealant and firestopping materials according to manufacturer's written recommendations.
- C. Deliver and store stainless-steel sheets with mill-applied adhesive protective paper maintained through fabrication and installation
- D. Deliver and store all ductwork with protective material until installation. Any material left exposed to moisture and/or particulates shall be removed and replaced.
- E. Any installed ductwork or piping system left temporarily incomplete shall be covered with protective material until final connections can be installed.
- F. All ductwork and/or liner insulation to be wrapped with protective material until installation. Any ductwork or insulation left exposed to the environment or contaminating particulate matter shall be replaced at the contractor's expense.

## **PART 2 - PRODUCTS**

### **2.1 SHEET METAL MATERIALS**

- A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.
- B. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets; commercial quality; with oiled, exposed matte finish.
- C. Stainless Steel: ASTM A 480/A 480M, Type 316, sheet form with No. 4 finish for surfaces of ducts exposed to view; and Type 304, sheet form with No. 1 finish for concealed ducts.
- D. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

- E. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for 36-inch (900-mm) length or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

## **2.2 SEALANT MATERIALS**

- A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.
  - 1. Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant, formulated with a minimum of 75 percent solids.
  - 2. Flanged Joint Mastics: One-part, acid-curing, silicone, elastomeric joint sealants, complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

## **2.3 HANGERS AND SUPPORTS**

- A. Hanger Materials: Galvanized, sheet steel or round, threaded steel rod.
  - 1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rod or galvanized rods with threads painted after installation.
  - 2. Straps and Rod Sizes: Comply with latest edition of SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for sheet steel width and thickness and for steel rod diameters.
- B. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- C. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.
  - 1. Supports for Galvanized-Steel Ducts: Galvanized steel shapes and plates.
  - 2. Supports for Stainless-Steel Ducts: Stainless-steel support materials.
  - 3. Supports for Aluminum Ducts: Aluminum support materials, unless materials are electrolytically separated from ductwork.

## **2.4 RECTANGULAR DUCT FABRICATION**

- A. General: Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction with galvanized, sheet steel, according to the latest edition of SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Comply with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
  - 1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.
  - 2. Materials: Free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.
- B. Fabricate range hood exhaust ducts with 0.0598-inch- thick, galvanized sheet for concealed ducts and 0.0500-inch- thick stainless steel for exposed ducts. Weld and flange seams and joints. Comply with NFPA 96.
- C. Fabricate dishwasher hood exhaust ducts with 0.0500-inch- thick stainless steel. Weld and flange seams and joints.
- D. Static-Pressure Classifications: Unless otherwise indicated, construct ducts to the following:
  - 1. Supply Ducts between AHU and Air Terminal Units: 3-inch wg.
  - 2. Supply Ducts after air terminal units and on constant volume supply equipment: 1-inch wg (250 Pa), positive pressure
  - 3. Return Ducts: 1-inch wg ,negative pressure.

- 4. Exhaust Ducts: 1-inch wg negative pressure.
- E. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of unbraced panel area, unless ducts are lined.

## **2.5 ROUND FABRICATION**

- A. Round Ducts: Fabricate spiral seam supply and return ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Snap Lock Longitudinal seam ductwork will not be allowed. Adjustable elbows will not be allowed.
- B. Spiral seam round or oval duct may be substituted for rectangular duct at the contractors option. Spiral seam ductwork sizing must result in the same or less pressure drop than the rectangular duct indicated on the plans.

## **2.6 DUCT STORAGE**

- A. All duct must have end capped with plastic covers on both ends from end of fabrication to duct installation.

## **PART 3 - EXECUTION**

### **3.1 DUCT INSTALLATION, GENERAL**

- A. Duct installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts, fittings, and accessories.
- B. Construct and install each duct system for the specific duct pressure classification indicated.
- C. Install round ducts in lengths not less than 10 feet (3 m), unless interrupted by fittings.
- D. Install ducts with fewest possible joints.
- E. Install fabricated fittings for changes in directions, changes in size and shape, and connections.
- F. Install couplings tight to duct wall surface with a minimum of projections into duct.
- G. Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs.
- H. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- I. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.
- J. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions, unless specifically indicated.
- K. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.
- L. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.
- M. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. Overlap opening on four sides by at least 1-1/2 inches (38 mm).
- N. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire damper, sleeve, and firestopping sealant. Fire and smoke

dampers are specified in Division 15 Section "Duct Accessories." Firestopping materials and installation methods are specified in Division 7 Sections.

### **3.2 SEAM AND JOINT SEALING**

- A. General: Seal duct seams and joints according to the duct pressure class indicated and as described in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." All duct to be sealed to SMACNA seal class A which requires sealing all transverse joints, longitudinal seams and duct wall penetrations regardless of pressure classification.
- B. Seal externally insulated ducts before insulation installation.
- C. All ducts shall be inspected after sealing is complete and prior to insulation installation. Provide the engineer with a minimum 7 days notice prior to beginning duct insulation.

### **3.3 RANGE HOOD EXHAUST DUCT INSTALLATIONS**

- A. Install ducts to allow for thermal expansion of ductwork through 2000 deg F temperature range.
- B. Install ducts without dips or traps that may collect residues, unless traps have continuous or automatic residue removal.
- C. Install access openings at each change in direction and at 15-foot intervals; locate on sides of duct a minimum of 1-1/2 inches from bottom; and fit with grease-tight covers of same material as duct.
- D. Do not penetrate fire-rated assemblies.

### **3.4 DISHWASHER EXHAUST DUCT INSTALLATIONS**

- A. Install dishwasher exhaust ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- B.

### **3.5 HANGING AND SUPPORTING**

- A. Install rigid round and rectangular metal duct with support systems indicated in the latest edition of SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- B. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.
- C. Support vertical ducts at a maximum interval of 16 feet and at each floor.
- D. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

### **3.6 CONNECTIONS**

- A. Connect equipment with flexible connectors according to Division 15 Section "Duct Accessories."
- B. For branch, outlet and inlet, and terminal unit connections, comply with the latest edition of SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

### **3.7 DUCT APPLICATION**

- A. Service: Round and rectangular, supply/return/outside -air ducts, concealed.
  - 1. Sheet-metal with wrap insulation
- B. Service: Round and rectangular, supply/return/outside -air ducts, exposed and in mechanical rooms.

1. Sheet-metal double wall with lined insulation in-between.
2. Inner sheet-metal duct shall be perforated in areas with acoustical requirements, ref. plans.

C.

### **3.8 FIELD QUALITY CONTROL**

- A. Disassemble, reassemble, and seal segments of systems as required to accommodate leakage testing and as required for compliance with test requirements.
- B. 25% of the duct installed after the air handling units and (prior to the air terminal units, when applicable) shall be tested in the presence of the Architect, at static pressures equal to maximum design pressure of system or section being tested. The sections of duct to be tested shall be chosen by the architect or engineer after installation of the duct. If pressure classifications are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.**
- C. Leakage Test: Perform tests according to SMACNA's "HVAC Air Duct Leakage Test Manual."
- D. Maximum Allowable Leakage: Comply with requirements for Leakage Classification 3 for round, Leakage Classification 12 for rectangular ducts in pressure classifications less than and equal to 2-inch wg (both positive and negative pressures), and Leakage Classification 6 for pressure classifications from 2- to 10-inch wg.
- E. Remake leaking joints and retest until leakage is less than maximum allowable.

### **3.9 CLEANING**

- A. After completing system installation, including outlet fittings and devices, inspect the system. Vacuum ducts before final acceptance to remove dust and debris.

**END OF SECTION**

**SECTION 15820  
DUCT ACCESSORIES**

**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. Backdraft dampers.
  2. Manual-volume dampers.
  3. Fire dampers.
  4. Turning vanes.
  5. Duct-mounted access doors and panels.
  6. Flexible ducts.
  7. Flexible connectors.
  8. Duct accessory hardware.
- B. Related Sections include the following:
1. Division 8 Sections for wall- and ceiling-mounted access doors and panels.
  2. Division 10 Sections for intake and relief louvers and vents connected to ducts and installed in exterior walls.
  3. Division 15 Section "Diffusers, Registers, and Grilles."
  4. Division 16 Sections for duct-mounted fire and smoke detectors.

**1.3 SUBMITTALS**

- A. Product Data: For the following:
1. Backdraft dampers.
  2. Manual-volume dampers.
  3. Fire dampers.
  4. Duct-mounted access doors and panels.
  5. Flexible ducts.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, location, and size of each field connection. Detail the following:
1. Special fittings and manual- and automatic-volume-damper installations.
  2. Fire-damper installations, including sleeves and duct-mounted access doors and panels.
- C. Product Certificates: Submit certified test data on dynamic insertion loss; self-noise power levels; and airflow performance data, static-pressure loss, dimensions, and weights.

## **1.4 QUALITY ASSURANCE**

- A. NFPA Compliance: Comply with the following NFPA standards:
  - 1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
  - 2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

## **1.5 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
  - 1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

## **PART 2 - PRODUCTS**

### **2.1 SHEET METAL MATERIALS**

- A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.
- B. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets, commercial quality, with oiled, exposed matte finish.
- C. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- D. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for 36-inch (900-mm) length or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

### **2.2 BACKDRAFT DAMPERS**

- A. Description: Suitable for horizontal or vertical installations.
- B. Frame: 0.052-inch- (1.3-mm-) thick, galvanized, sheet steel, with welded corners and mounting flange.
- C. Blades: 0.025-inch- (0.6-mm-) thick, roll-formed aluminum.
- D. Blade Seals: Vinyl.
- E. Blade Axles: Galvanized steel.
- F. Tie Bars and Brackets: Galvanized steel.
- G. Return Spring: Adjustable tension.

### **2.3 MANUAL-VOLUME DAMPERS**

- A. General: Factory fabricated with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.
- B. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.
  - 1. Steel Frames: Hat-shaped, galvanized, sheet steel channels, minimum of 0.064 inch (1.62 mm) thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.
  - 2. Roll-Formed Steel Blades: 0.064-inch- (1.62-mm-) thick, galvanized, sheet steel.
  - 3. Blade Axles: Galvanized steel.
  - 4. Tie Bars and Brackets: Galvanized steel.
- C. Jackshaft: 1-inch- (25-mm-) diameter, galvanized steel pipe rotating within a pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
  - 1. Length and Number of Mountings: Appropriate to connect linkage of each damper of a multiple-damper assembly.
- D. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

## **2.4 FIRE DAMPERS**

- A. General: Labeled to UL 555.
- B. Fire Rating: One and one-half hours.
- C. Fire Rating: One and one-half hours.
- D. Frame: SMACNA Type B with blades out of airstream; fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.
- E. Mounting Sleeve: Factory- or field-installed galvanized, sheet steel.
  - 1. Minimum Thickness: 0.052 inch (1.3 mm) or 0.138 inch (3.5 mm) thick as indicated, and length to suit application.
  - 2. Exceptions: Omit sleeve where damper frame width permits direct attachment of perimeter mounting angles on each side of wall or floor, and thickness of damper frame complies with sleeve requirements.
- F. Mounting Orientation: Vertical or horizontal as indicated.
- G. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized, sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized steel blade connectors.
- H. Horizontal Dampers: Include a blade lock and stainless-steel negator closure spring.
- I. Fusible Link: Replaceable, 165 deg F (74 deg C) rated as indicated.

## **2.5 TURNING VANES**

- A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- B. Acoustic Turning Vanes: Fabricate of airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

## **2.6 DUCT-MOUNTED ACCESS DOORS AND PANELS**

- A. General: Fabricate doors and panels airtight and suitable for duct pressure class.
- B. Frame: Galvanized, sheet steel, with bend-over tabs and foam gaskets.
- C. Door: Double-wall, galvanized, sheet metal construction with insulation fill and thickness, and number of hinges and locks as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.
- D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.
- E. Insulation: 1-inch- (25-mm-) thick, fibrous-glass or polystyrene-foam board.

## **2.7 FLEXIBLE CONNECTORS**

- A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.
- B. Standard Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches (89 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.
- C. Extra-Wide Metal-Edged Connectors: Factory fabricated with a strip of fabric 5-3/4 inches (146 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.
- D. Transverse Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches (89 mm) wide attached to two strips of 4-3/8-inch- (111-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.
- E. Conventional, Indoor System Flexible Connector Fabric: Glass fabric double coated with polychloroprene.
  - 1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
  - 2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp, and 360 lbf/inch (63 N/mm) in the filling.
- F. Conventional, Outdoor System Flexible Connector Fabric: Glass fabric double coated with a synthetic-rubber, weatherproof coating resistant to the sun's ultraviolet rays and ozone environment.
  - 1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).

2. Tensile Strength: 530 lbf/inch (93 N/mm) in the warp, and 440 lbf/inch (77 N/mm) in the filling.

## **2.8 FLEXIBLE DUCTS**

- A. General: Comply with UL 181, Class 1.
- B. Flexible Ducts, Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-1/2-inch- (38-mm-) thick, glass-fiber insulation around a continuous inner liner.
  1. Reinforcement: Steel-wire helix encapsulated in inner liner.
  2. Outer Jacket: Polyethylene film.
  3. Inner Liner: Polyethylene film.
- C. Pressure Rating: 6-inch wg (1500 Pa) positive, 1/2-inch wg (125 Pa) negative.

## **2.9 ACCESSORY HARDWARE**

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments, and length to suit duct insulation thickness.
- B. Splitter Damper Accessories: Zinc-plated damper blade bracket; 1/4-inch (6-mm), zinc-plated operating rod; and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.
- C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches (75 to 450 mm) to suit duct size.
- D. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and NAIMA's "Fibrous Glass Duct Construction Standards" for fibrous-glass ducts.
- B. Install volume dampers in lined duct; avoid damage to and erosion of duct liner.
- C. Provide test holes at fan inlet and outlet and elsewhere as indicated.
- D. Install fire and smoke dampers according to manufacturer's UL-approved written instructions.
  1. Install fusible links in fire dampers.
- E. Install duct access panels for access to both sides of duct coils. Install duct access panels downstream from volume dampers, fire dampers, turning vanes, and equipment.

1. Install duct access panels to allow access to interior of ducts for cleaning, inspecting, adjusting, and maintaining accessories and terminal units.
  2. Install access panels on side of duct where adequate clearance is available.
- F. Label access doors according to Division 15 Section "Mechanical Identification."

### **3.2 ADJUSTING**

- A. Adjust duct accessories for proper settings.
- B. Adjust fire dampers for proper action.
- C. Final positioning of manual-volume dampers is specified in Division 15 Section "Testing, Adjusting, and Balancing."

**END OF SECTION**

**SECTION 15837  
CENTRIFUGAL FANS**

**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 centrifugal fans and vent sets.

**1.3 PERFORMANCE REQUIREMENTS**

- A. Project Altitude: Base air ratings on actual site elevations.
- B. Operating Limits: Classify according to AMCA standards.

**1.4 SUBMITTALS**

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each unit scheduled and include the following:
  - 1. Certified fan performance curves with system operating conditions indicated.
  - 2. Certified fan sound-power ratings.
  - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
  - 4. Material gages and finishes, including color charts.
  - 5. Dampers, including housings, linkages, and operators.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 1. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
- C. Maintenance Data: For centrifugal fans to include in maintenance manuals specified in Division 1.

**1.5 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.
- C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations, with protective crating and covering.
- B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.
- C. Lift and support units with manufacturer's designated lifting or supporting points.

## **1.7 COORDINATION**

- A. Coordinate size and location of structural support members and/or shaft locations.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7.

## **1.8 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Belts: One set for each belt-driven unit.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cook, Loren Company.
  - 2. Greenheck.

### **2.2 HOUSINGS**

- A. Roof Mounted Centrifugal Exhaust Fan.
  - 1. The fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum structural components shall be constructed of minimum 16 gauge marine alloy aluminum, bolted to a rigid aluminum support structure. The aluminum base shall have continuously welded curb cap corners for maximum leak protection. The discharge baffle shall have a rolled bead for added strength. An integral conduit chase shall be provided through the curb cap and into the motor compartment to facilitate wiring connections. Bearings and drives shall be mounted on a minimum 14 gauge steel power assembly, isolated from the unit structure with rubber vibration isolators. These

components shall be enclosed in a weather-tight compartment, separated from the exhaust airstream. Unit shall bear an engraved aluminum nameplate and shall be shipped in ISTA certified transit tested packaging.

## **2.3 WHEELS**

- A. Roof Mounted Centrifugal Exhaust Fan
  - 1. Wheel shall be centrifugal backward inclined, constructed of 100% aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.

## **2.4 SHAFTS**

- A. Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.
- B. Turned, ground, and polished hot-rolled steel with keyway. Ship with a protective coating of lubricating oil.
- C. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

## **2.5 BEARINGS**

- A. Prelubricated and Sealed Shaft Bearings: Self-aligning, pillow-block-type ball bearings.
  - 1. Ball-Bearing Rating Life: ABMA 9,  $L_{50}$  of 200,000 hours.
  - 2. Roller-Bearing Rating Life: ABMA 11,  $L_{50}$  of 200,000 hours.

## **2.6 BELT DRIVES**

- A. Description: Factory mounted, with final alignment and belt adjustment made after installation.
  - 1. Service Factor Based on Fan Motor: 1.5.
- B. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
- C. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with motors larger than 5 hp. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
- D. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
- E. Motor Mount: Adjustable for belt tensioning.

## **2.7 ACCESSORIES**

- A. Scroll Access Doors: Shaped to conform to scroll, with quick-opening latches and gaskets.
- B. Companion Flanges: Galvanized steel, for duct connections.
- C. Scroll Drain Connection: NPS 1 (DN 25) steel pipe coupling welded to low point of fan scroll.
- D. Shaft Cooler: Metal disk between bearings and fan wheel, designed to dissipate heat from shaft.
- E. Spark-Resistant Construction: AMCA 99 (where required).
- F. Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.
- G. Weather Cover: Enameled-steel sheet with ventilation slots, bolted to housing.

## **2.8 MOTORS**

- A. Refer to Division 15 Section "Motors" for general requirements for factory-installed motors.
- B. Motor Construction: NEMA MG 1, general purpose, continuous duty, high efficiency, Design B.
- C. Enclosure Type: [Open dripproof] [Totally enclosed, fan cooled].

## **2.9 SOURCE QUALITY CONTROL**

- A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
- B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install centrifugal fans level and plumb.
- B. Install units with clearances for service and maintenance.
- C. Label fans according to requirements specified in Division 15 Section "Mechanical Identification."

### **3.2 CONNECTIONS**

- A. Duct installation and connection requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 15 Section "Duct Accessories."

- B. Install ducts adjacent to fans to allow service and maintenance.
- C. Ground equipment.
- D. 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.

### **3.3 FIELD QUALITY CONTROL**

- A. Equipment Startup Checks:
  - 1. Verify that shipping, blocking, and bracing are removed.
  - 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
  - 3. Verify that cleaning and adjusting are complete.
  - 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
  - 5. Verify lubrication for bearings and other moving parts.
- B. Starting Procedures:
  - 1. Energize motor and adjust fan to indicated rpm.
  - 2. Measure and record motor voltage and amperage.
- C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
- D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Shut unit down and reconnect automatic temperature-control operators.
- F. Refer to Division 15 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.
- G. Replace fan and motor pulleys as required to achieve design airflow.
- H. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

### **3.4 ADJUSTING**

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Lubricate bearings.

### **3.5 CLEANING**

- A. On completion of installation, internally clean fans according to manufacturer's written instructions. Remove foreign material and construction debris. Vacuum fan wheel and cabinet.
- B. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

### **3.6 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain centrifugal fans.
  - 1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
  - 2. Review data in maintenance manuals. Refer to Division 1 Section "Closeout Procedures."
  - 3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

**END OF SECTION**

**SECTION 15855  
DIFFUSERS, REGISTERS, AND GRILLES**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.
- B. Related Sections include the following:
  - 1. Division 10 Sections for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
  - 2. Division 15 Section "Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.
  - 3. Division 15 Section "Testing, Adjusting, and Balancing" for balancing diffusers, registers, and grilles.

**1.3 DEFINITIONS**

- A. Diffuser: Circular, square, or rectangular air distribution outlet, generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.
- B. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling, or floor.
- C. Register: A combination grille and damper assembly over an air opening.

**1.4 SUBMITTALS**

- A. Product Data: For each model indicated, include the following:
  - 1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.
  - 2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.
  - 3. Schedule of diffusers, registers, and grilles indicating drawing designation, room location, quantity, model number, size, and accessories furnished.
  - 4. Assembly Drawing: For each type of air outlet and inlet; indicate materials and methods of assembly of components.

- B. Coordination Drawings: Reflected ceiling plans and wall elevations drawn to scale to show locations and coordination of diffusers, registers, and grilles with other items installed in ceilings and walls.

## **1.5 QUALITY ASSURANCE**

- A. NFPA Compliance: Install diffusers, registers, and grilles according to NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURED UNITS**

- A. Diffusers, registers, and grilles are scheduled on Drawings.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Titus.
  - 2. Price

### **2.2 SOURCE QUALITY CONTROL**

- A. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. Install diffusers, registers, and grilles level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.
- 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 practicable. . Coordinate device locations with ceiling grid, sprinklers, and lights. 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 connection 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.

### **3.4 CLEANING**

- A. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

**END OF SECTION**

**SECTION 15990**  
**TESTING, ADJUSTING, AND BALANCING**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:
  - 1. Balancing airflow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.
  - 2. Adjusting total HVAC systems to provide indicated quantities.
  - 3. Measuring electrical performance of HVAC equipment.
  - 4. Setting quantitative performance of HVAC equipment.
  - 5. Verifying that automatic control devices are functioning properly.
  - 6. Reporting results of the activities and procedures specified in this Section.
- B. Related Sections include the following:
  - 1. Testing and adjusting requirements unique to particular systems and equipment are included in the Sections that specify those systems and equipment.
  - 2. Field quality-control testing to verify that workmanship quality for system and equipment installation is specified in system and equipment Sections.

**1.3 DEFINITIONS**

- A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.
- B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.
- C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.
- D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.
- E. Report Forms: Test data sheets for recording test data in logical order.
- F. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

- G. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.
- H. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
- I. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.
- J. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.
- K. Test: A procedure to determine quantitative performance of a system or equipment.
- L. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.
- M. AABC: Associated Air Balance Council.
- N. CTI: Cooling Tower Institute.
- O. NEBB: National Environmental Balancing Bureau.
- P. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

#### **1.4 SUBMITTALS**

- A. Quality-Assurance Submittals: Within 30 days from the Contractor's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below.
- B. Certified Testing, Adjusting, and Balancing Reports: Submit 2 copies of reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.
- C. Warranty: Submit 2 copies of special warranty specified in the "Warranty" Article below.

#### **1.5 QUALITY ASSURANCE**

- A. Agent Qualifications for larger projects: Engage a testing, adjusting, and balancing agent certified by AABC.
- B. Agent Qualifications for smaller projects: Engage a testing, adjusting, and balancing agent certified by NEBB.
- C. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:
  - 1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.

2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.

- D. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC's "National Standards for Testing, Adjusting, and Balancing."
- E. Testing, Adjusting, and Balancing Reports: Use standard forms from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."
- F. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards.
- G. Instrumentation Type, Quantity, and Accuracy: As described in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."
- H. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

## **1.6 PROJECT CONDITIONS**

- A. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

## **1.7 COORDINATION**

- A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.
- B. Notice: Provide 7 days' advance notice for each test. Include scheduled test dates and times.
- C. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

## **1.8 WARRANTY**

- A. General Warranty: The national project performance guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

## **PART 2 - PRODUCTS (Not Applicable)**

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.
  - 1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.
  - 2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- B. Examine approved submittal data of HVAC systems and equipment.
- C. Examine project record documents described in Division 1.
- D. Examine Architect's and Engineer's design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine equipment performance data, including fan and pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems-- Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.
- F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.
- G. Examine system and equipment test reports.
- H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
- J. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- K. Examine terminal units, such as variable-air-volume boxes and mixing boxes, to verify that they are accessible and their controls are connected and functioning.
- L. Examine equipment for installation and for properly operating safety interlocks and controls.
- M. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices operate by the intended controller.
  2. Dampers and valves are in the position indicated by the controller.
  3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
  4. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
  5. Sensors are located to sense only the intended conditions.
  6. Sequence of operation for control modes is according to the Contract Documents.
  7. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
  8. Interlocked systems are operating.
  9. Changeover from heating to cooling mode occurs according to design values.
- N. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

### **3.2 PREPARATION**

- A. Complete system readiness checks and prepare system readiness reports. Verify the following:
1. Permanent electrical power wiring is complete.
  2. Automatic temperature-control systems are operational.
  3. Equipment and duct access doors are securely closed.
  4. Balance, fire dampers are open.
  5. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
  6. Windows and doors can be closed so design conditions for system operations can be met.

### **3.3 GENERAL TESTING AND BALANCING PROCEDURES**

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC national standards and this Section.
- B. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.
- C. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.
- D. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

### **3.4 FUNDAMENTAL AIR SYSTEMS' BALANCING PROCEDURES**

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Check the airflow patterns from the outside-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.

### **3.5 CONSTANT-VOLUME AIR SYSTEMS' BALANCING PROCEDURES**

- A. The procedures in this Article apply to constant-volume supply-, return-, and exhaust-air systems.
- B. Adjust fans to deliver total design airflows within the maximum allowable rpm listed by the fan manufacturer.
  - 1. Measure fan static pressures to determine actual static pressure as follows:
    - a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
    - b. Measure static pressure directly at the fan outlet or through the flexible connection.
    - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
  - 2. Measure static pressure across each air-handling unit component.
    - a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.
  - 3. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
  - 4. Adjust fan speed higher or lower than design with the approval of the Architect. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
  - 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 no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.

- C. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design airflows within specified tolerances.
  - 1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
    - a. Where sufficient space in submains and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
  - 2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submains and branch ducts to design airflows within specified tolerances.
- D. Measure terminal outlets and inlets without making adjustments.
  - 1. Measure terminal outlets using a direct-reading hood or the outlet manufacturer's written instructions and calculating factors.
- E. Adjust terminal outlets and inlets for each space to design airflows within specified tolerances of design values. Make adjustments using volume dampers rather than extractors and the dampers at the air terminals.
  - 1. Adjust each outlet in the same room or space to within specified tolerances of design quantities without generating noise levels above the limitations prescribed by the Contract Documents.
  - 2. Adjust patterns of adjustable outlets for proper distribution without drafts.

### **3.6 MOTORS**

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
  - 1. Manufacturer, model, and serial numbers.
  - 2. Motor horsepower rating.
  - 3. Motor rpm.
  - 4. Efficiency rating if high-efficiency motor.
  - 5. Nameplate and measured voltage, each phase.
  - 6. Nameplate and measured amperage, each phase.
  - 7. Starter thermal-protection-element rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

### **3.7 CONDENSING UNITS**

- A. Verify proper rotation of fans and measure entering- and leaving-air temperatures. Record compressor data.

### **3.8 HEAT-TRANSFER COILS**

- A. Electric-Heating Coils: Measure the following data for each coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperatures at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kW at full load.
6. Fuse or circuit-breaker rating for overload protection.

### **3.9 TEMPERATURE TESTING**

- A. During testing, adjusting, and balancing, report need for adjustment in temperature regulation within the automatic temperature-control system.
- B. Measure outside-air, wet- and dry-bulb temperatures.

### **3.10 TEMPERATURE-CONTROL VERIFICATION**

- A. Verify that controllers are calibrated and commissioned.
- B. Check transmitter and controller locations and note conditions that would adversely affect control functions.
- C. Record controller settings and note variances between set points and actual measurements.
- D. Verify operation of limiting controllers (i.e., high- and low-temperature controllers).
- E. Verify free travel and proper operation of control devices such as damper and valve operators.
- F. Verify sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water-flow measurements. Note the speed of response to input changes.
- G. Confirm interaction of electrically operated switch transducers.
- H. Confirm interaction of interlock and lockout systems.
- I. Verify main control supply-air pressure and observe compressor and dryer operations.
- J. Record voltages of power supply and controller output. Determine if the system operates on a grounded or nongrounded power supply.
- K. Note operation of electric actuators using spring return for proper fail-safe operations.

### **3.11 TOLERANCES**

- A. Set HVAC system airflow and water flow rates within the following tolerances:
  1. Supply and Exhaust Fans: Plus 5 to plus 10 percent.
  2. Air Outlets and Inlets: 0 to minus 10 percent.
  3. Cooling-Water Flow Rate: 0 to minus 5 percent.

### **3.12 FINAL REPORT**

- A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in 3-ring binder, tabulated and divided into sections by tested and balanced systems.
- B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.
  - 1. Include a list of the instruments used for procedures, along with proof of calibration.
- C. Final Report Contents: In addition to the 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, but do not include approved Shop Drawings and Product Data.
- D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:
  - 1. Title page.
  - 2. Name and address of testing, adjusting, and balancing Agent.
  - 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 testing, adjusting, and balancing Agent who certifies the report.
  - 10. Summary of contents, including the following:
    - a. Design versus final performance.
    - b. Notable characteristics of systems.
    - c. Description of system operation sequence if it varies from the Contract Documents.
  - 11. Nomenclature sheets for each item of equipment.
  - 12. Data for terminal units, including manufacturer, type size, and fittings.
  - 13. Notes to explain why certain final data in the body of reports vary from design values.
  - 14. Test conditions for fans and pump performance forms, including the following:
    - a. Settings for outside-, return-, and exhaust-air dampers.
    - b. Conditions of filters.
    - c. Cooling coil, wet- and dry-bulb conditions.
    - d. Face and bypass damper settings at coils.
    - e. Fan drive settings, including settings and percentage of maximum pitch diameter.
    - f. Settings for supply-air, static-pressure controller.
    - g. Other system operating conditions that affect performance.
- E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present with single-line diagrams and include the following:
  - 1. Quantities of outside, supply, return, and exhaust airflows.
  - 2. Water and steam flow rates.
  - 3. Duct, outlet, and inlet sizes.
  - 4. Pipe and valve sizes and locations.
  - 5. Terminal units.

6. Balancing stations.
- F. Roof Top Unit Test Reports: For air-handling units with coils, include the following:
1. Unit Data: Include the following:
    - a. Unit identification.
    - b. Location.
    - c. Make and type.
    - d. Model number and unit size.
    - e. Manufacturer's serial number.
    - f. Unit arrangement and class.
    - g. Discharge arrangement.
    - h. Sheave make, size in inches (mm), and bore.
    - i. Number of belts, make, and size.
    - j. Number of filters, type, and size.
  2. Motor Data: Include the following:
    - a. Make and frame type and size.
    - b. Horsepower and rpm.
    - c. Volts, phase, and hertz.
    - d. Full-load amperage and service factor.
  3. Test Data: Include design and actual values for the following:
    - a. Total airflow rate in cfm (L/s).
    - b. Total system static pressure in inches wg (Pa).
    - c. Fan rpm.
    - d. Discharge static pressure in inches wg (Pa).
    - e. Preheat coil static-pressure differential in inches wg (Pa).
    - f. Cooling coil static-pressure differential in inches wg (Pa).
    - g. Heating coil static-pressure differential in inches wg (Pa).
    - h. Outside airflow in cfm (L/s).
    - i. Return airflow in cfm (L/s).
    - j. Outside-air damper position.
    - k. Return-air damper position.
    - l. Discharge air temperature
- G. Electric-Coil Test Reports: For electric duct coils, and electric coils installed in central-station air-handling units, include the following:
1. Unit Data: Include the following:
    - a. System identification.
    - b. Location.
    - c. Coil identification.
    - d. Capacity in Btuh (kW).
    - e. Number of stages.
    - f. Connected volts, phase, and hertz.
    - g. Rated amperage.
    - h. Discharge air temperature
  2. Test Data: Include design and actual values for the following:

- a. Heat output in Btuh (kW).
- b. Airflow rate in cfm (L/s).
- c. Air velocity in fpm (m/s).
- d. Entering-air temperature in deg F (deg C).
- e. Leaving-air temperature in deg F (deg C).
- f. Voltage at each connection.
- g. Amperage for each phase.

H. Fan Test Reports: For exhaust fans, include the following:

1. Fan Data: Include the following:

- a. System identification.
- b. Location.
- c. Make and type.
- d. Model number and size.
- e. Manufacturer's serial number.
- f. Arrangement and class.

2. Motor Data: Include the following:

- a. Make and frame type and size.
- b. Horsepower and rpm.
- c. Volts, phase, and hertz.
- d. Full-load amperage and service factor.
- e. Number of belts, make, and size.

3. Test Data: Include design and actual values for the following:

- a. Total airflow rate in cfm (L/s).
- b. Total system static pressure in inches wg (Pa).
- c. Fan rpm.
- d. Discharge static pressure in inches wg (Pa).
- e. Suction static pressure in inches wg (Pa).

I. Condenser Reports: For refrigerant side of unitary systems, stand-alone refrigerant compressors, air-cooled condensing units, include the following:

1. Unit Data: Include the following:

- a. Unit identification.
- b. Location.
- c. Unit make and model number.
- d. Manufacturer's compressor serial numbers.
- e. Compressor make.
- f. Compressor model and serial numbers.
- g. Refrigerant weight in lb (kg).

2. Test Data: Include design and actual values for the following:

- a. Entering-air, dry-bulb temperature in deg F (deg C).
- b. Leaving-air, dry-bulb temperature in deg F (deg C).
- c. Control settings.
- d. Unloader set points.
- e. Low-pressure-cutout set point in psig (kPa).

- f. High-pressure-cutout set point in psig (kPa).
- g. Suction pressure in psig (kPa).
- h. Suction temperature in deg F (deg C).
- i. Condenser refrigerant pressure in psig (kPa).
- j. Condenser refrigerant temperature in deg F (deg C).
- k. Oil pressure in psig (kPa).
- l. Oil temperature in deg F (deg C).
- m. Voltage at each connection.
- n. Amperage for each phase.
- o. The kW input.
- p. Number of fans.

### **3.13 ADDITIONAL TESTS**

- A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

**END OF SECTION**

**SECTION 16010  
SUMMARY OF ELECTRICAL WORK**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and other Division 15 Specification Sections, apply to this Section.

**1.2 WORK COVERED BY CONTRACT DOCUMENTS**

- A. The following Summary of Work is intended as an aid to achieve an understanding of the various elements of work included in the project, as is not intended to be all-inclusive. Detailed descriptions of work and requirements are given in drawings and specifications.
- B. General Scope of Work:
  - 1. Providing new panels, feeders, conduits, electrical meter, disconnect, combination starter/ disconnect, fire alarm, rough-in for telephone and data system, and new light fixtures.

**1.4 COORDINATION**

- A. All electrical work shall be done under sub-contract to a General Contractor. Electrical Contractor shall coordinate all work through General Contractor, even in areas where only electrical work is to take place.
- B. Work shall take place with minimal disruption to Owner's operations in areas surrounding the new building.
- C. Cooperate fully with other contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.
- D. Fully coordinate with mechanical contractor for providing power to mechanical equipment.

**1.5 UTILITIES**

- 1. Coordinate with power company and provide conduit, and trenching from transformer to power source. Coordinate with water, telephone, cable and gas utilities to locate all utilities prior to digging in any area.
- 2. Obtain any approvals required from utilities to relocate utilities.
- 3. Cost of relocating or bypassing utilities indicated on drawings shall be included in Base Bid.

**1.6 CONTRACTOR USE OF PREMISES**

- A. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.
  - 1. Owner Occupancy: Allow for Owner occupancy and use by the public.
  - 2. Driveways and Entrances: Keep driveways and entrances serving the premises, clear and available to the Owner, the Owner's employees, and emergency vehicles at all time. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- B. Site Safety: Take every precaution to ensure the site does not present a threat to the safety of occupants and/or workers. Minimal safety requirements include, but are not limited to the following:
  - 1. Temporary fencing around construction areas.

2. Yellow caution tape and construction barricades along open trenches during the day. Trenches shall be covered at night and warning lights provided on construction barricades.
3. Temporary fencing around equipment while site work is in progress.

**1.7 SUBMITTALS**

1. To expedite the submittal process more efficiently, do not piece-meal the submittals. Submit entire electrical in a bound enclosure. This will eliminate delays in the submittal process. Unbound submittals shall be returned without review. Submit 10 copies minimum.

**1.8 CONTINGENCY FUND**

- 1 Refer to architectural specifications for all project contingencies.

**END OF SECTION**

**SECTION 16020  
BASIC ELECTRICAL REQUIREMENTS**

**PART 1 – GENERAL**

**1.1 RELATED REQUIREMENTS**

- A. The General Provisions, Supplemental General Provisions, Special Provisions, Division 1 Specification Sections and all relevant documents shall form a part of this Division of the Specifications, and shall be incorporated in this Section and each Division 16 Section hereinafter as if repeated verbatim herein. All conditions imposed by these documents shall be applicable to all portions of the work under this Division. Certain specific paragraphs of said references may be referred to hereinafter in this Division. These references are intended to point out specific items to the Contractor, but in no way relieve him of the responsibility of reading and complying with all relevant parts of the entire Specification.
- B. The Contractor shall examine and coordinate with all Contract Drawings and Specifications, and all Addenda issued. Failure to comply shall not relieve him of responsibility. The omission of details of other portions of the work from this Division shall not be used as a basis for a request for additional compensation.
- C. The specific features and details for other portions of the work related to the construction in progress or to the adjacent building shall be determined by examination at the site.

**1.2 SCOPE OF WORK**

- A. The requirements contained in this Section apply to all work performed under Division 16 of these Specifications.
- B. The work covered by this Division of the Specifications comprises the furnishing of labor, material, equipment, transportation, tools and services, and performing operations required for, and reasonably incidental to, the installation of the work in accordance with the applicable Contract Documents, and subject to the terms and conditions of the Contract.
- C. Refer to other Divisions of the Specifications for related work.

**1.3 DEFINITION OF "CONTRACTOR"**

- A. Where the word "Contractor" is used under any Section of this Division of the Specifications, it shall mean the Contractor engaged to execute the work included under that Section, even though this Contractor may be technically described as a Subcontractor, or an authorized representative.
- B. If the Contractor, engaged to execute a portion of the work, employs a Subcontractor to perform some of that work, he shall be completely responsible for the proper execution of this Subcontractor's work, in full conformity with the Contract Documents.

**1.4 RESPONSIBILITY OF THE CONTRACTOR**

- A. The Contractor shall be responsible for all work of every description in connection with this Division of the Specifications. The Contractor shall specifically and distinctly assume, and does so assume, all risk for damage or injury from whatever cause to property or person used or employed on or in connection with this work and of all damages or injury to any person or property wherever located, resulting from an action or operation under the Contract in connection with the work, and undertake the responsibility to defend the Owner against all claims on account of any such damage or injury.
- B. The Contractor will be held responsible for the satisfactory execution and completion of the work in accordance with the true intent of the Contract Documents. The Contractor shall provide without extra charge all incidental items required as part of the work, even though it may not be specifically indicated. If the Contractor has reason for objecting to the use of any material, equipment, device or method of construction as indicated, the Contractor shall make report of such objections to the Owner's Representative, obtain proper approval and adjustment to the Contract, and shall proceed with the work.

**1.5 TERMINOLOGY**

- A. Whenever the words "furnish", "provide", "furnish and install", "provide and install", and similar phrases occur, it is the intent that the materials, equipment and devices described

be furnished, installed and connected under this Division, complete for operation, unless specifically noted to the contrary.

- B. It is also the intent, unless specifically noted to the contrary, that all materials, equipment and devices described and specified under this Division of the Specifications be similarly furnished, installed and connected under this Division, whether or not a phrase as described in the preceding paragraph has been actually included.
- C. Whenever the words "Owner's Representative" occurs, it is intended to refer to the Architect, Engineer and/or specific Owner's Representative responsible for or capable of providing the necessary direction pertaining to the referenced issue.

#### **1.6 ORDINANCES, PERMITS AND CODES**

- A. It shall be the Contractor's duty to perform the work and provide the materials covered by these specifications in conformance with all ordinances and regulations of all authorities having jurisdiction.
- B. All work herein shall conform to all applicable laws, ordinances and regulations of the local utility companies.
- C. The Contractor shall obtain and pay for all permit and connection fees as required for the complete installation of the specified systems, equipment, devices and materials.
- D. The Contractor shall obtain permits, plan checks, inspections and approvals applicable to the work as required by the regulatory authorities. Fees and costs of any nature whatsoever incidental to these permits, inspections and approvals shall be assumed and paid by the Contractor. The pro-rata costs, if any, for utilities serving this property will be paid for by the Owner and shall not be included as part of this Contract.
- E. The work shall be in accordance with, but shall not be limited to, the requirements of:
  - 1 National Fire Protection Association
  - 2 National Electrical Code
  - 3 National Safety Code
  - 4 State of Texas Safety Code
  - 5. Local City Building Codes
  - 6. State of Texas Building Codes
- F. Codes and standards referred to are minimum standards. Where the requirements of the Drawings or Specifications exceed those of the codes and regulations, the Drawings and Specifications govern.

#### **1.7 MATERIALS, EQUIPMENT AND DEVICE DESCRIPTION**

- A. Materials, equipment and devices shall be of the best quality customarily applied in quality commercial practice, and shall be the products of reputable manufacturers. Each major component shall bear a nameplate giving the name and address of the manufacturer, and the catalog number or designation of the component.
- B. Materials, equipment and devices furnished under this Division of the Specifications shall be essentially the standard product of the specified manufacturer, or where allowed, an alternate manufacturer. Where two or more units of the same kind or class of a specific item are required, these shall be the products of a single manufacturer; however, the component parts of the item need not be the products of one manufacturer.
- C. In describing the various materials, equipment and devices, in general each item will be described singularly, even though there may be a multiplicity of identical items. Also, where the description is only general in nature, exact sizes, duties, space arrangements, horsepower requirements and other data shall be determined by reference to the Contract Documents.
- D. Space allocations for materials, equipment and devices have been made on the basis of present and known future requirements and the dimensions of items of equipment or devices of a particular manufacturer whether indicated or not. The Contractor shall verify that all materials, equipment and devices proposed for use on this project are within the constraints of the allocated space.

#### **1.8 QUALITY ASSURANCE**

- A. Materials, equipment and devices shall be new and of the quality specified, and shall be

free from defects at the time of installation. Materials, equipment and devices damaged in shipment or otherwise damaged or found defective prior to acceptance by the Owner shall not be repaired at the job site, but shall be replaced with new materials, equipment or devices identical with those damaged, unless specifically approved otherwise by the Owner's Representative.

- B. Wherever a UL standard has been established for a particular type of material, equipment or device, each item of such material, equipment or device provided on this project shall meet the requirements of the UL standard in every way, and shall be UL listed and labeled.

### **1.9 REFERENCE STANDARDS**

- A. Materials, equipment, devices and workmanship shall comply with applicable local, county, state and national codes, laws and ordinances, utility company regulations and industry standards.
- B. In case of differences between building codes, state laws, local ordinances, industry standards, utility company regulations and the Contract Documents, the most stringent shall govern. The Contractor shall promptly notify the Owner's Representative in writing of any such difference. Should the Contractor perform any work that does not comply with local codes, laws and ordinances, industry standards or other governing regulations, the work shall be corrected of noncompliance deficiencies with the Contractor bearing all costs.
- C. In addition to the aforementioned ordinances, industry standards published by the following organizations shall apply:

AABM	-	American Association of Battery Manufacturers
ADA	-	American's with Disabilities Act
AIA	-	American Institute of Architects
ANSI	-	American National Standards Institute
ASTM	-	American Society for Testing and Materials
CBM	-	Certified Ballast Manufacturers Association
ETL	-	Electrical Testing Laboratories
FM	-	Factory Mutual
ICEA	-	Insulated Cable Engineers Associated
IEEE	-	Institute of Electrical and Electronic Engineers
IES	-	Illuminating Engineering Society
IRI	-	Industrial Risk Insurance
NBS	-	National Bureau of Standards
NEC	-	National Electrical Code
NECA	-	National Electrical Contractors Association
NEMA	-	National Electrical Manufacturers Association
NESC	-	National Electrical Safety Code
NETA	-	National Electrical Testing Association
NFPA	-	National Fire Protection Association
UL	-	Underwriters Laboratories

### **1.10 DRAWINGS AND SPECIFICATIONS**

- A. The interrelation of the Drawings (including the schedules) and the Specifications are as follows:
  - 1 The Drawings establish quantities, locations, dimensions and details of materials, equipment and devices. The schedules on the Drawings indicate the capacities, characteristics and components.
  - 2 The Specifications provide written requirements for the quality, standard and nature of the materials, equipment, devices and construction systems.
- B. The Drawings and Specifications shall be considered as being compatible; therefore, the work called for by one and not by the other shall be furnished and installed as though

called for by both. Resolution of conflicts between Drawings and Specifications shall be as follows:

- 1 If the Drawings and Specifications disagree in themselves, or with each other, the Contractor's pricing shall be based on furnishing and installing the most expensive combination of quality and quantity of work indicated for a complete operable system. Contractor is responsible to notifying the Architect and Engineer. In the event of this type of disagreement, the resolution shall be determined by the Owner's Representative. The contractor shall assume for an operable system at the most expensive combination as per the latest National Electrical Code. The contractor shall review all drawings and specifications prior to bid date.
  - 2 The Contractor shall be responsible for bringing any conflicts in the Drawings and the Specifications to the attention of the Owner's Representative immediately, prior to bid date.
  - 3 In general, if there is conflict between the Drawings and Specifications, the Drawings shall govern the Specifications.
  - 4 Where the Specifications do not fully agree with schedules on the Drawings, the schedules shall govern. Actual numerical dimensions indicated on the Drawings govern scale measurements and large scale details govern small scale drawings.
  - 5 Materials, equipment and devices called for on the Drawings and not indicated herein, shall be completely provided and installed as though it were fully described herein.
  - 6 Materials, equipment and devices called for herein shall be completely provided and installed, whether or not it is fully detailed, scheduled or indicated on the Drawings.
- C. The Contractor shall examine the Drawings and Specifications of the other portions of the work for fixtures and finishes in connection with this work. The Contractor shall carefully examine the Drawings to determine the general construction conditions, and shall familiarize himself with all limitations caused by such conditions.
- D. When discrepancies exist between scale and dimension, or between the Drawings of the various portions of the work, they shall be called to the attention of the Owner's Representative for further instruction, whose instructions shall be final and binding and work promptly resumed without any additional cost to the Owner.
- E. Review the construction details of the building(s) as illustrated on the Drawings of the other portions of the work, i.e., architectural, structural, civil, landscape, etc., and be guided thereby. Route conduits and set all boxes as required by the pace of the general construction.
- F. The Drawings diagrammatically show the sizes and locations of the various equipment and devices, and the sizes of the major interconnecting wires, without showing exact details as to elevations, offsets, control wiring and other installation requirements. Carefully layout the work at the site to conform to the architectural and structural conditions, to avoid obstructions and to permit proper grading of pipe associated with other portions of the work. In cooperation with other Contractors, determine the exact location of equipment and devices and connections thereto by reference to the submittals and rough-in drawings, and by measurements at the site. Make minor relocations necessitated by the conditions at the site, or directed by the Owner's Representative, without additional cost to the Owner.
- G. The Drawings and Specifications are intended to describe and illustrate systems which will not interfere with the structure of the building(s), fit into the available spaces, and insure complete and satisfactory operating installations. Prepare installation drawings as required for all critical areas illustrating the installation of the work in this Division as related to the work of all other Divisions and correct all interferences with the other portions of the work or with the building structures before the work proceeds.
- H. The Drawings do not indicate the existing electrical installations other than to identify modifications or extensions thereto. Visit the site and ascertain the conditions to be met

and the work to be accomplished in removing and modifying the existing work, and in installing the new work. Failure to comply with this shall not constitute grounds for any additional payment in connection with removing or modifying any part of the existing installation or installing any new or temporary work under this Division.

#### **1.11 SUBMITTALS**

- A. Submit product data and shop drawings in accordance with Division 1 of the Specifications.
- B. Process product data and shop drawings to insure that the proposed materials, equipment and devices conform to the requirements of the Contract Documents, and that there are no omissions or duplications. Provide layouts, fabrication information and data for systems, materials, equipment and devices proposed for the project.
- C. Submittals shall be provided for review and approval on all systems, equipment, devices and materials proposed for use on this project. Submittals shall include, but not be limited to, the following:
  - 1 Lighting and Appliance Panelboards
  - 2 Disconnect Switches
  - 3 Circuit Breakers and Fuses
  - 4 Materials: conduit, conductors, connectors, supports, etc.
  - 5 Lighting Fixtures, Lamps and Control Systems/Devices
  - 6 Wiring Devices
  - 7 Transformers
  - 8 Distribution Panelboards
  - 9 Motor Control Center
  - 10 As indicated on each submittal section
- D. The product data shall not consist of manufacturer's catalogs or cut sheets that contain no indication of the exact item offered. The submission on individual items shall designate the exact item offered.
- E. Do not submit detailed quantitative listings of materials, equipment and devices. It is the Contractor's responsibility to provide proper sizes and quantities to conform to Contract Documents.
- F. Assemble submittals on related items procured from a single manufacturer in bound brochures or other suitable package form, rather than submitting a multiplicity of loose sheets.
- G. Prepare shop drawings whenever equipment proposed varies in physical size and arrangement from that indicated thus causing rearrangement of equipment space, where tight spaces require extreme coordination between this work and other work, where called for elsewhere in these Specifications and where specifically requested by the Owner's Representative. Shop drawings shall be prepared at a scale of not less than 1/4 inch equals 1 foot.
- H. The Contractor shall sign the submittal as an indication of compliance with the Contract Documents. If there are any deviations from the Contract Documents, he shall so indicate on the submittal. Any deviations not so indicated shall be cause for rejection and removal of the non-complying equipment at the Contractor's expense.

#### **1.12 SUBSTITUTIONS**

- A. Where a single manufacturer is mentioned by trade name or manufacturer's name, unless specifically noted otherwise, it is the only manufacturer that will be accepted.
- B. Where multiple manufacturers are listed, none other than those manufacturers will be accepted.
- C. Manufacturers not listed will be considered for substitution prior to bid only. The substitute manufacturer shall submit a complete copy of the appropriate technical specification section minimum seven (7) business days prior to bid with each subparagraph noted with the comment, "compliance", "deviation", "alternate" or "not applicable". In the case of non-primary, vendor-supplied items, the name of the sub-vendor supplying said item, including model number, shall be indicated.

- 1 By noting the term "compliance" or "C", it shall be understood that the manufacturer is in full compliance with the item specified and will provide exactly the same with no deviations.
  - 2 By noting the term "deviation" or "D", it shall be understood that the manufacturer prefers to provide a different component in lieu of that specified. Manufacturer shall indicate all deviations.
  - 3 By noting the term "alternate" or "A", it shall be understood that the manufacturer proposes to provide the same operating function but prefers to do it in a different manner. An alternate shall be fully described as to what the manufacturer proposes to provide.
  - 4 By noting the term "not applicable" or "N/A", it shall be understood that the specified item is not applicable to the project.
- D. It shall be understood that space allocations have been made on the basis of present and known future requirements and the dimensions of items of equipment or devices of a particular manufacturer whether indicated or not. If any item of equipment or device is offered in substitution which differs substantially in dimension or configuration from that indicated on the Drawings or specifications, provide as part of the submittal 1/4 inch equals 1 foot scaled drawings showing that the substitute can be installed in the space available without interfering with other portions of the work or with access for operations and maintenance in the completed project.
- E. Where substitute equipment or devices requiring different arrangement or connections from that indicated is accepted by the Owner's Representative, install the equipment or devices to operate properly and in harmony with the intent of the Contract Documents, making all incidental changes in piping, ductwork or wiring resulting from the equipment or device selection without any additional cost to the Owner. The Contractor shall pay all additional costs incurred by other portions of the work in connection with the substituted equipment or device.
- F. The Owner's Representative reserves the right to call for samples of any item of material, equipment or device offered in substitution, together with a sample of the specific item when, in their opinion, the quality of the item and/or the appearance is involved, and it is deemed that an evaluation of the item may be better made by visual inspection.
- G. When any request for a substitution of material, equipment or device is submitted and rejected, the item named in the Contract Documents shall be furnished. Repetitive submittal of substitutions for the same item will not be considered.

### **1.13 INSTALLATION DRAWINGS**

- A. Prepare installation drawings for coordinating the work of this Division with the work of other Divisions, to illustrate its concealment in finished spaces, to avoid obstructions, and to demonstrate the adaptability of any item of material, equipment or device in the space upon which the Contract Documents are based.
- B. Use these drawings in the field for the actual installation of this work. Provide three (3) copies, not for approval, to the Owner's Representative for his information, review and record.

### **1.14 WORKMANSHIP AND INSTALLATION**

- A. In no case shall the Contractor provide a class of material, equipment, device or workmanship less than that required by the Contract Documents or applicable codes, regulations, ordinances or standards. All modifications which may be required by a local authority having legal jurisdiction over all or any part of the work shall be made by the Contractor without any additional charge. In all cases where such authority requires deviations from the requirements of the Drawings or Specifications, the Contractor shall report same to the Owner's Representative and shall secure his approval before the work is started.
- B. The work shall be performed by properly licensed technicians skilled in their respective trades. All materials, equipment and devices shall be installed in accordance with the recommendations of the manufacturer and in the best standard practice to bring about

results of a first class condition.

- C. The NECA "Standards of Installation" as published by the National Electrical Contractors Association shall be considered a part of these Specifications, except as specifically modified by other provisions contained in these Specifications.

#### **1.15 INSPECTION OF SITE**

- A. The accompanying drawings do not indicate existing installations other than to identify modifications of and extensions thereto. The Contractor shall visit the site, inspect the installations and ascertain the conditions to be met and the work to be performed. Failure to comply with this shall not constitute ground for any additional payments in connection with removing or modifying any part of the existing installations and/or installing any new work under this Division.
- B. Review construction details of the adjacent building presently under construction during the site inspection and include all work required to modify the existing installations and install new materials, comprising a part of the installation. Review all construction details of the new building as illustrated on the drawings and be guided thereby.

#### **1.16 WARRANTY**

- A. All materials, equipment, devices and workmanship shall be warranted for a period of one year from the date of acceptance by the Owner's Representative for beneficial use by the Owner, except that where specific equipment is noted to have extended warranties. The warranty shall be in accordance with AIA Document A201. The Contractor shall be responsible for the proper registration of these warranties so that the Owner can make all proper claims should future need develop.
- B. The Contractor shall furnish to the Owner's Representative for transmittal to the Owner, the name, address and telephone number of those persons responsible for service on systems and equipment covered by the warranty.

#### **1.17 OPERATION PRIOR TO ACCEPTANCE**

- A. When any equipment is operable, and it is to the advantage of the Contractor to operate the equipment, the Contractor may do so provided that he properly supervises the operation, and retains full responsibility for the equipment operated. Regardless of whether or not the equipment has or has not been operated, the Contractor shall clean the equipment properly, make required adjustments and complete punch list items before final acceptance by the Owner.

#### **1.18 INSTRUCTION OF OWNER'S PERSONNEL**

- A. Provide the services of competent engineers and/or technicians acceptable to the Owner's Representative to instruct other representatives of the Owner in the complete and detailed operation of each item of equipment or device of all the various electrical systems. These instructions shall be provided for whatever periods may be necessary to accomplish the desired results. Upon completion of these instructions, the Contractor shall obtain a letter of release, acknowledged by the Owner or his authorized representative, stating the dates on which the various kinds of instruction were given, and the personnel to whom the instructions were given.
- B. The Contractor shall be fully responsible for proper maintenance of equipment and systems until the instructions have been given to the Owner's personnel and the letter of release acknowledged.
- C. In providing the instructions to the Owner's personnel, the written operating and maintenance manuals shall be followed in all instances, and the Owner's personnel shall be familiarized with such manuals. Operating and maintenance manuals used for instructions shall include wiring diagrams, manufacturer's operating and maintenance instructions, parts lists (with sources identified), and other data as appropriate for each system.

#### **1.19 SCHEDULE AND SEQUENCE OF WORK**

- A. The Contractor shall meet and cooperate with the Owner and Owner's Representative to schedule and sequence this work so as to insure meeting scheduled completion dates and avoid delaying other portions of the work. Work requiring special sequencing shall be at no additional cost to the Owner and shall have no impact on the schedule.

## **1.20 INSTALLATION INSPECTIONS AND CERTIFICATIONS**

- A. Obtain timely inspections of the installation by the regulatory authorities. Remedy any deficiencies to the satisfaction of the inspecting official.
- B. Upon final completion of the work, obtain certificates of acceptance from the regulatory authorities. Deliver the certificates to the Owner's Representative for transmission to the Owner.

## **1.21 EQUIPMENT INSTALLATION**

- A. Install equipment and devices in a manner to permit access to all surfaces or components, requiring such access, without the need to disassemble other unrelated parts of the work.
- B. Equipment specified to be factory assembled and tested prior to shipment shall not be disassembled at the job site and reassembled at its final location. Apparatus not so specified may be disassembled and reassembled in the proper location.
- C. Furnish all scaffolding, rigging and hoisting required for the installation of all the work.

## **1.22 CONCRETE HOUSEKEEPING PADS**

- A. Concrete housekeeping pads shall be provided for all floor mounted equipment, unless noted or required otherwise.
- B. All pads shall be not less than 3-1/2" high and extend a maximum 3" beyond the actual equipment size. Coordinate the proper size of the pad with the equipment furnished. Pads shall be poured in forms built of new dressed lumber with corners chamfered using sheet metal or triangular wood strips nailed to the form. Use 6 x 6 No. 3 mesh for reinforcing. Install heavy duty adjustable anchor bolts, set in the form and positioned using templates, prior to pouring concrete. After the equipment is set on the pad, the equipment shall be aligned, leveled and fully grouted to the pad and all void spaces shall be filled with a non-shrinking grout.
- C. Perform all concrete work specified to be provided under this Division in strict accordance with the applicable provisions of Division 3, CONCRETE.

## **1.23 SLEEVES**

- A. Each conduit, regardless of material, which passes through a concrete slab, masonry wall, or roof or portion of the building structure shall be free from the structure and shall pass through a sleeve.
- B. All sleeves shall be constructed from electrical-metallic tubing or equivalent weight galvanized steel tubing and shall be flush on both sides of the surface penetrated, unless noted otherwise. All sleeves penetrating the roof areas shall extend a minimum 10 inches above the roof with approved weatherproof counterflashing attached to the conduit above the roof. All sleeves penetrating floors shall extend a minimum of 6 inches above the finished floors. The sleeves shall be sized to allow free passage of the conduit to be inserted.
- C. Sleeves passing through walls or floors on or below grade or in moist areas shall be constructed of galvanized rigid steel and shall be designed with a suitable flange in the center to form a waterproof passage. After the conduit has been installed in the sleeves, the void space around the conduit shall be caulked and filled with an asphalt-base compound to insure a waterproof penetration. Jute twine caulking shall not be used due to susceptibility to termite infestation.

## **1.24 ESCUTCHEONS**

- A. In each finished space, provide a chromium plated, sectional escutcheon on each conduit, or hanger rod penetrating a wall, floor or ceiling.
- B. Size escutcheons and collars to fit snugly around conduit and rods.
- C. Where required, provide escutcheons with set screws so that they fit snugly against the finished surface.

## **1.25 ACCESS PANELS**

- A. Provide wall and ceiling access panels for unrestricted access to all concealed electrical equipment items and devices installed behind furrings, chases or non-removable

suspended ceilings.

- B. Access panels shall be UL listed and labeled as required to suit the fire rating of the surface in which installed, with mounting straps, concealed hinges, screwdriver locks, 180 degree open door design, 16 gauge steel construction and door and frame finished in prime coat finish. Panels shall be 12-inch by 12-inch minimum size, but shall be larger as the access requirement of the concealed electrical equipment item or device increases.

**1.26 SEALING OF PENETRATIONS**

- A. All penetrations in horizontal or vertical fire-rated construction shall be sealed using approved fire-rated sealing materials equivalent to the following:
  - 1 Foam: Dow Corning 3-6548 RTV silicone foam, liquid component Part 4 (black) and liquid component Part B (off-white).
  - 2 Sealant: Dow Corning 96-081 RTV silicone adhesive sealant.
  - 3 Damming Materials: Mineral fiberboard, mineral fiber matting, mineral fiber putty, plywood or particle board, as selected by applicator.
- B. Preparation: Remove combustible materials and loose impediments from penetration opening and involved surfaces. Remove free liquid and oil from penetration surfaces.
- C. Installation: In accordance with manufacturer's instructions, install damming materials and sealant to cover and seal penetration openings; inject foam mixtures into openings.
- D. In addition to the Dow Corning products, equal products by Spec Seal Firestop Products, 3M Fire Barrier or CS240 Firestop are acceptable.

**1.27 PROTECTION OF APPARATUS**

- A. At all times take every precaution to properly protect apparatus from damage due to dust, dirt, water, etc. or from damage due to physical forces. Include the erection of temporary shelters as required, to adequately protect any apparatus stored at the site, the cribbing of any apparatus directly above the construction, and the covering of apparatus in the incomplete building with tarpaulins or other protective covering. Failure on the part of the Contractor to comply with the above to the entire satisfaction of the Owner's Representative will be sufficient cause for the rejection of the pieces of apparatus in question.
- B. Responsibility for the protection of apparatus extend also to existing apparatus involved in this Division of the work, whether such apparatus is designated to be used temporarily and later removed, or is to be reused as a part of the permanent installation. Erect temporary sheltering structures, provide temporary bracing and supports, or cover equipment as required or directed to afford proper protection for that equipment.
- C. The Contractor shall protect this work and the work of all other Contractors from damage by his work or workmen and shall make good any damage thus caused. He shall also be responsible for the proper protection of his equipment, machinery, materials and accessories delivered and installed on the job.

**1.28 INSTALLATION OF CONTROL AND OPERATING DEVICES**

- A. The highest operable part of controls (light switches, dimmer switches, emergency power off devices, etc.), receptacles (electrical and communications) and other operable devices shall be 48" above finish floor. The lowest operable part shall be no less than 15" above finished floor. For purposes of uniformity, unless noted otherwise, the top of a device shall be maximum 48" AFF and the bottom of a device shall be minimum 15" AFF. Refer to the electrical symbols list on the Drawings for specific requirements.
- B. Visual alarm appliances shall be placed 80" above finished floor (the highest floor level within a space) or 6" below the ceiling, whichever is lower.

**1.29 INSTALLATION AND CONNECTION OF OTHER DIVISION'S EQUIPMENT**

- A. Verify the electrical requirements of all equipment furnished under other Divisions, separate contracts, or by the Owner. Install conduit, power wiring, control wiring, devices, etc. as required for complete operation of all equipment.

**1.30 OPTION TO RELOCATE OUTLETS AND RELATED DEVICES**

- A. The location of power, data and telephone outlets, wall switches and other related devices may be relocated at the Owner's option, at no additional cost to the Owner, to a point within 10 feet of their present location provided the Contractor is notified prior to

installation.

**1.31 COOPERATION AND CLEAN-UP**

- A. It shall be the responsibility of the Contractor to cooperate fully to keep the job site in a clean and safe condition. Upon the completion of the job, the Contractor shall immediately remove all of his tools, equipment, surplus materials and debris.
- B. After the installation is complete, and before the equipment is energized, clean the interior and exterior of all equipment thoroughly. Clean equipment, removing all debris, rubbish and foreign materials. Each component shall be cleaned and all dust and other foreign material removed. Components shall be cleaned of oxidation. The inside and outside of all switchgear shall also be wiped clean with a lemon-oil rag after all other cleaning is complete.
- C. Any portion of the work requiring touch-up finishing shall be so finished to equal the specified finish on the product.

**1.32 RECORD DRAWINGS AND DOCUMENTATION FOR OWNER**

- A. The Contractor shall obtain at his own expense a complete set of blue-line prints on which to keep an accurate record of the installation of all materials, equipment and devices covered by the Contract. The Contractor shall record up to date information at least once a week and retain the set of prints on site for periodic review by the Architect/Engineer. The record drawings shall indicate the location of all equipment and devices, and the routing of all systems. If the Contractor prepared large scale installation drawings of electrical rooms, conduit routing, busduct, routing, etc., these drawings or reproducible sepia's therefrom shall be revised as required to accurately illustrate the actual installation. All conduit buried in concrete slabs, walls and below grade shall be located by dimension; both horizontally and by vertical elevation, unless a surface mounted device in each space indicates the exact location.
- B. Upon anticipated completion of the job, obtain one complete reproducible set of the original drawings on which to neatly, legibly and accurately transfer all project related notations and deliver these record drawings to the Architect/Engineer at job completion before final payment and delivery to the Owner. This information shall be delivered prior to final acceptance.
- C. The Contractor shall accumulate in duplicate during the job progress, the following data prepared in indexed 3-ring looseleaf, hard-back binders sized for 8-1/2 inch by 11 inch sheets. No binder shall exceed 3-1/2 inches thick. This data shall be turned over to the Owner's Representative for review and subsequent delivery to the Owner prior to final acceptance.
  - 1 Warranties, guarantees and manufacturer's directions on material, equipment and devices covered by the Contract.
  - 2 Approved lighting fixture brochures, wiring diagrams and control diagrams.
  - 3 Copies of approved submittals and shop drawings.
  - 4 Operating instructions and recommended maintenance procedures for major apparatus.
  - 5 Copies of all other data and/or drawings required during construction.
  - 6 Repair parts list of major apparatus, including name, address and telephone number of local supplier or representative.
  - 7 Tag charts and diagrams hereinbefore specified.

**1.33 FINAL OBSERVATION**

- A. The purpose of the final observation is to determine whether the Contractor has completed the construction in accordance with the Contract Documents and that in the Owner Representative's opinion the installation is satisfactory for final acceptance by the Owner.
- B. It shall be the responsibility of the Contractor to assure that the installation is ready for final acceptance prior to calling upon the Owner's Representative to make a final observation.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 16050**  
**BASIC ELECTRICAL MATERIALS AND METHODS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Raceways.
  - 2. Building wire and connectors.
  - 3. Supporting devices for electrical components.
  - 4. Electrical identification.
  - 5. Electricity-metering components.
  - 6. Concrete equipment bases.
  - 7. Electrical demolition.
  - 8. Cutting and patching for electrical construction.
  - 9. Touchup painting.

**1.3 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.

**1.4 SUBMITTALS**

- A. Product Data: For electricity-metering equipment.
- B. Shop Drawings: Dimensioned plans and sections or elevation layouts of electricity-metering equipment.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

**1.5 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

**1.6 COORDINATION**

- A. 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 to components furnished by utility companies.
  - 1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
  - 2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.
- D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Division 8 Section "Access Doors."
- E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
- F. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

**PART 2 - PRODUCTS**

## **2.1 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING**

- A. Current-Transformer Cabinets: Comply with requirements of electrical power utility company.
- B. Meter Sockets: Comply with requirements of electrical power utility company.
- C. Modular Meter Centers: Factory-coordinated assembly of a main meter center circuit-breaker unit with wireways, tenant meter socket modules, and tenant branch circuit breakers arranged in adjacent vertical sections, complete with interconnecting buses.
  - 1. Housing: NEMA 250, Type 3R enclosure.
  - 2. Tenant Branch Circuit Breakers: Series combination rated to protect circuit breakers in downstream panelboards that have 10,000-A interrupting capacity, minimum.

## **2.2 CONCRETE BASES**

- A. Concrete Forms and Reinforcement Materials: As specified in Division 3 Section "Cast-in-Place Concrete."
- B. Concrete: 3000-psi (20.7-MPa), 28-day compressive strength as specified in Division 3 Section "Cast-in-Place Concrete."

## **2.3 TOUCHUP 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 RACEWAY AND CABLE INSTALLATION**

- A. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.
- B. Install raceways and cables at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.
- C. Use temporary raceway caps to prevent foreign matter from entering.
- D. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.
- E. Use raceway and cable fittings compatible with raceways and cables and suitable for use and location.
- F. Install raceways embedded in slabs in middle third of slab thickness where practical, and leave at least 1-inch (25-mm) concrete cover.
  - 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
  - 2. Space raceways laterally to prevent voids in concrete.
  - 3. Install conduit larger than 1-inch trade size (DN27) parallel to or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support.
  - 4. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
  - 5. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for exposed parallel raceways.
- G. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel 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 the pull wire.
- H. Install telephone and signal system raceways, 2-inch trade size (DN53) and smaller, in maximum lengths of 150 feet (45 m) and with a maximum of two 90-degree bends or equivalent.

Separate lengths with pull or junction boxes where necessary to comply with these requirements, in addition to requirements above.

- I. Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 72-inch (1830-mm) flexible conduit. Install LFMC in wet or damp locations. Install separate ground conductor across flexible connections.
- J. Set floor boxes level and trim after installation to fit flush to finished floor surface.

### **3.3 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.

### **3.4 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 or screw-type nails.
  - 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.

### **3.5 IDENTIFICATION MATERIALS AND DEVICES**

- A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.
- C. Self-Adhesive Identification Products: Clean surfaces before applying.
- D. Identify raceways and cables with color banding as follows:
  1. Bands: Pretensioned, snap-around, colored plastic sleeves or colored adhesive marking tape. Make each color band 2 inches (51 mm) wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
  2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (8-m) maximum intervals in congested areas.
  3. Colors: As follows:
    - a. Fire Alarm System: Red.
    - b. Security System: Blue and yellow.
    - c. Telecommunication System: Green and yellow.
- E. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.
- F. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches (150 to 200 mm) below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches (400 mm), overall, use a single line marker.
- G. Color-code 208/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
  1. Phase A: Black.
  2. Phase B: Red.
  3. Phase C: Blue.
  4. Neutral: White.
  5. Ground: Green.
- H. Color-code 480/277-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
  1. Phase A: BROWN.
  2. Phase B: ORANGE.
  3. Phase C: YELLOW.
  4. Neutral: White with a colored stripe or gray.
  5. Ground: Green.
- I. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed 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.
- J. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch- (9-mm-) high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

### **3.6 UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT**

- A. Install equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

**3.7 FIRESTOPPING**

- 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 Section "Firestopping."

**3.8 CONCRETE BASES**

- A. 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."

**3.9 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.

**3.10 FIELD QUALITY CONTROL**

- A. Inspect installed components for damage and faulty work, including the following:
  - 1. Raceways.
  - 2. Building wire and connectors.
  - 3. Supporting devices for electrical components.
  - 4. Electrical identification.
  - 5. Electricity-metering components.
  - 6. Concrete bases.
  - 7. Electrical demolition.
  - 8. Cutting and patching for electrical construction.
  - 9. Touchup painting.
- B. Test Owner's electricity-metering installation for proper operation, accuracy, and usability of output data.
  - 1. Connect a load of known kW rating, 1.5 kW minimum, to a circuit supplied by the metered feeder.
  - 2. Turn off circuits supplied by the metered feeder and secure them in the "off" condition.
  - 3. Run the test load continuously for eight hours, minimum, or longer to obtain a measurable meter indication. Use a test load placement and setting that ensure continuous, safe operation.
  - 4. Check and record meter reading at end of test period and compare with actual electricity used based on test load rating, duration of test, and sample measurements of supply voltage at the test load connection. Record test results.
  - 5. Repair or replace malfunctioning metering equipment or correct test setup; then retest. Repeat for each meter in installation until proper operation of entire system is verified.

**3.11 REFINISHING AND TOUCHUP PAINTING**

- A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 9 Section "Painting."
  - 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.

**3.12 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**

**SECTION 16055  
SITE ELECTRICAL**

**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- A. The General Provisions, Supplemental General Provisions, Special Provisions and Division 1 Specification sections, apply to work covered by this Section.

**1.2 SCOPE OF WORK**

- A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of all site electrical work.
- B. The site electrical work shall include, but not be limited to, the furnishing and installation of necessary materials and making arrangements for:
  - 1. The connection of electrical and telephone utilities.
  - 2. Underground conduit.

**1.3 SUBMITTALS**

- A. Submit product data and shop drawings in accordance with Division 1 for products specified under PARTS 2 PRODUCTS.

**1.4 REFERENCE STANDARDS**

- A. National Electrical Code (NEC), Article 300
- B. Service installation standards of the serving utility company(s).

**PART 2 PRODUCTS**

**2.1 ELECTRICAL SERVICE**

- A. Coordination: The location of the service entrance shall be coordinated with all other trades. Provide materials and equipment required to connect the electrical service. Contractor shall coordinate with the Power Company for all requirements prior to bid date. Contractor shall include all cost to for Utility Company to extend service to project site bid.
- B. Materials: Provide materials in accordance with other Sections of these Specifications.

**2.2 COMMUNICATION SERVICE**

- A. Coordination: The location of the telephone, cable, and internet service entrance shall be coordinated with all other trades. Provide materials and equipment required to connect the telephone, cable and internet services. Contractor shall coordinate with the Telephone , cable, and internet company for all requirements prior to bid date. Contractor is responsible to coordinate with utility companies.
- B. Materials: Provide materials in accordance with other sections of this specification.

**PART 3 EXECUTION**

**3.1 GENERAL**

- A. Underground installation of more than one conduit shall be in a duct arrangement as indicated. All conduits shall be laid so joints are staggered. All bends and stub-ups shall be rigid steel.
- B. Pour a red colored concrete envelope 3" thick over utility service, emergency generator and fire pump conduits. Where conduits cross a driveway, road or parking area, reinforcing rods shall be installed.
- C. Perform excavation, shoring, backfilling and concrete work in connection with electrical work in accordance with other Divisions of the Specifications.
- D. All conduit shall be sloped away from the building to negate water entering the building through the conduit system.

**3.2 UTILITIES**

- A. The locations, elevations and voltage of electrical lines and the location of the telephone lines included within the area of this work are indicated on the Drawings or in the Specifications in accordance with information received by the Architect/Engineer and Owner.
- B. The Contractor shall examine the site and shall verify, to his own satisfaction, the location and elevation of all utilities, and shall adequately inform himself as to their relation to the work.

- C. Existing utility lines not indicated but encountered during construction shall be protected, relocated or capped as directed by the Architect/Engineer. All precautions shall be exercised to prevent damage to existing lines not shown, but should work become necessary, it must be authorized prior to execution except in an emergency situation.
- D. Before beginning excavations of any nature whatsoever, the Contractor shall make an attempt to locate all underground utilities of every nature occurring within the bounds of the area to be excavated. The Contractor shall then proceed with caution in his excavation work so that no utility shall be damaged with a resultant loss of service.
- E. Should a damage result to any utility through the Contractor's negligence or failure to comply with the above directive, he shall be liable for such damage and for all expense incurred in the expeditious repair or replacement of such damaged utilities.
- F. Repair of damaged utilities shall be to a condition equal to or better than the adjacent undamaged portion of such utility and to the complete satisfaction of the Architect/Engineer and Owner.

**END OF SECTION**

**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 grounding and bonding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.
- B. Related Sections include the following:
  - 1. Division 2 Section "Underground Ducts and Utility Structures" for ground test wells.

**1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Product Data: For the following:
  - 1. Ground rods.
  - 2. Chemical rods.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- D. Field Test Reports: Submit written test reports to include the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

**1.4 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
  - 1. Comply with UL 467.
- B. Comply with NFPA 70; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.
- C. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Grounding Conductors, Cables, Connectors, and Rods:
    - a. Apache Grounding/Erico Inc.
    - b. Boggs, Inc.
    - c. Chance/Hubbell.
    - d. Copperweld Corp.
    - e. Dossert Corp.
    - f. Erico Inc.; Electrical Products Group.
    - g. Framatome Connectors/Burndy Electrical.
    - h. Galvan Industries, Inc.
    - i. Hastings Fiber Glass Products, Inc.
    - j. Ideal Industries, Inc.
    - k. ILSCO.
    - l. Kearney/Cooper Power Systems.
    - m. Korns: C. C. Korns Co.; Division of Robroy Industries.
    - n. Lyncole XIT Grounding.
    - o. O-Z/Gedney Co.; a business of the EGS Electrical Group.

- p. Racco, Inc.; Division of Hubbell.
- q. Robbins Lightning, Inc.
- r. Salisbury: W. H. Salisbury & Co.
- s. Thomas & Betts, Electrical.

## 2.2 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Division 16 Section "Conductors and Cables."
- B. Material: copper.
- C. Equipment Grounding Conductors: Insulated with green-colored insulation.
- D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
- E. Grounding Electrode Conductors: Stranded cable.
- F. Underground Conductors: stranded, unless otherwise indicated.
- G. Copper Bonding Conductors: As follows:
  - 1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch (6.4 mm) in diameter.
  - 2. Bonding Conductor: No. 4 AWG, stranded copper conductor.
  - 3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches (42 mm) wide and 1/16 inch (1.5 mm) thick.
  - 4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches (42 mm) wide and 1/16 inch (1.5 mm) thick.
- H. Ground Conductor and Conductor Protector for Wood Poles: As follows:
  - 1. No. 4 AWG minimum, soft-drawn copper conductor.
  - 2. Conductor Protector: Half-round PVC or wood molding. If wood, use pressure-treated fir, or cypress or cedar.
- I. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

## 2.3 CONNECTOR PRODUCTS

- A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.
- B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.
- C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

## 2.4 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel.
  - 1. Size: 3/4 by 120 inches (19 by 3000 mm) in diameter.

## PART 3 - EXECUTION

### 3.1 APPLICATION

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
- B. In raceways, use insulated equipment grounding conductors.
- C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.
- D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.
- E. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.
- F. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
  - 1. Use insulated spacer; space 1 inch (25.4 mm) from wall and support from wall 6 inches (150 mm) above finished floor, unless otherwise indicated.
  - 2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the specified height above the floor.
- G. Underground Grounding Conductors: Use tinned copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches (600 mm) below grade or bury 12 inches (300 mm) above duct bank when installed as part of the duct bank.

### 3.2 EQUIPMENT GROUNDING CONDUCTORS

- A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
- B. Install equipment grounding conductors in all feeders and circuits.
- C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC:
  - 1. Feeders and branch circuits.
  - 2. Lighting circuits.
  - 3. Receptacle circuits.
  - 4. Single-phase motor and appliance branch circuits.
  - 5. Three-phase motor and appliance branch circuits.
  - 6. Flexible raceway runs.
  - 7. Armored and metal-clad cable runs.
- D. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
- E. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.
- F. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
- G. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
- H. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
- I. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.
- J. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate equipment grounding conductor to each electric water heater, heat-tracing, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.
- K. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
  - 1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch (6.4-by-50-by-300-mm) grounding bus.
  - 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- L. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.

### 3.3 INSTALLATION

- A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
  - 1. Drive ground rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.

2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.
- B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
- D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
- E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.
- F. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.
- G. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.
- H. Install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.
- I. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, Paragraph 250-81(c), using a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 4 AWG. If concrete foundation is less than 20 feet (6 m) long, coil excess conductor within the base of the foundation. 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 a grounding electrode external to concrete.

### 3.4 CONNECTIONS

- A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
  1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
  2. Make connections with clean, bare metal at points of contact.
  3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
  4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
  5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding

bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

- E. Connections at Test Wells: Use compression-type connectors on conductors and make bolted-and clamped-type connections between conductors and ground rods.
- F. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- G. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
- H. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

### **3.5 FIELD QUALITY CONTROL**

- A. Testing: Perform the following field quality-control testing:
  1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
  2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.

### **3.6 GRADING AND PLANTING**

- A. Restore surface features, including vegetation, at areas disturbed by Work of this Section. Reestablish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Comply with Division 2 Section "Landscaping." Maintain restored surfaces. Restore disturbed paving as indicated.

**END OF SECTION**

**SECTION 16075  
ELECTRICAL IDENTIFICATION**

**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- A. The General Provisions, Supplemental General Provisions, Special Provisions and Division 1 Specification sections, apply to work covered by this Section.
- B. Comply with Division 16 Sections, as applicable. Refer to other Divisions for coordination of work.

**1.2 SCOPE OF WORK**

- A. Provide labor, material, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of electrical identification, including related accessories.
- B. Provide electrical identification for the following:
  - 1. Panelboards, motor starters, contactors, disconnect switches, circuit breakers and other electrical equipment with nameplate identifying the item of equipment and the equipment serving the same.
  - 2. Raceways, junction boxes and pull boxes.
    - 1. Label each panelboard index indicating the room #s to the related circuit. Also add the index sheet in a laminated white core, plastic with beveled edges, minimum 1/16 inch thick. Lettering shall be machine-engraved, not less than 1/4" high, cut through the black or red surface to the white core.
    - 3. Wiring devices.
    - 4. Wiring.
    - 5. Three phase motor rotation.

**1.3 SUBMITTALS**

- A. Submit product data in accordance with Division 1 for products specified under PART 2 - PRODUCTS.

**PART 2 PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURERS**

- B. Brady
- C. Panduit
- D. Thomas & Betts
- E. Seton

**2.2 IDENTIFICATION**

- A. Nameplates
  - 1. Nameplates shall be black engraved surface on white core for normal power circuits and red engraved surface on white core for emergency power circuits.
  - 2. Provide for each distribution panelboard, branch circuit panelboard, transformer and any other similar equipment furnished under this Division identification as to its given name, voltage and origination of service. Examples are as follows:

'MDP'	'K'
208Y120V	208Y/120V
FED FROM 'MS'	FED FROM 'MDP'

- 3. Provide for each motor starter enclosure, circuit breaker enclosure, disconnect switch and any other similar equipment furnished under this Division, identification as to the specific load that it serves and the origination of service. Examples are as follows:

'RTU-1'	'RTU-2'
FED FROM 'MDP'	FED FROM 'MDP'

- 4. Provide for each feeder protective device in each distribution panelboard and any other similar equipment furnished under this Division, identification as to the specific load that it serves.
- 5. Nameplates shall be laminated, white core, plastic with beveled edges, minimum 1/16 inch thick. Lettering shall be machine-engraved, not less than 1/4" high, cut through the black or red surface to the white core.

B. Junction Boxes and Pull Boxes

- 1. Identification shall be with a black permanent marking pen on the top of 4" x 4" junction box covers or on the back of an outlet box cover plate identifying the branch circuits and systems within the conduit. Pull

- boxes shall be provided with a nameplate stating voltage and system served.
- C. Wiring Device Wall Plates
    - 1. On the back side of wiring device wall plates identify with a black permanent marking pen the panelboard and branch circuit number the device is served from.
  - D. Wire Markers
    - 1. Wire markers for identification of wiring shall be self-adhesive type having letters and numerals indicating serving equipment and feeder or branch circuit number.
  - F. Rotation Tags
    - 1. Rotation tags shall be brass or aluminum securely attached to equipment.

### **PART 3 EXECUTION**

#### **3.1 PREPARATION**

- A. Surfaces to receive labels or nameplates shall be carefully prepared in accordance with the manufacturer's instructions and recommendations.

#### **3.2 NAMEPLATES**

- A. Nameplates shall be properly attached to identify panelboards, feeder circuit breakers, disconnect switches, pull boxes and other similar equipment furnished under this Division.

#### **3.3 WIRE MARKERS**

- A. Wire markers shall be applied to each conductor or cable within panelboards, motor starter enclosures, circuit breaker enclosures, disconnect switches, cabinets, junction boxes, pull boxes, and other similar equipment identifying the serving equipment and feeder or branch circuit from which the conductors originate.

**END OF SECTION**

**SECTION 16120  
BUILDING WIRE AND CABLE**

**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 SUBMITTALS**

- A. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

**1.4 QUALITY ASSURANCE**

- A. Listing and Labeling: Provide wires and cables specified in this Section that are listed and labeled.
  - 1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
- B. Comply with NFPA 70.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver wires and cables according to NEMA WC 26.

**1.6 COORDINATION**

- A. Coordinate layout and installation of cables with other installations.
- B. Revise locations and elevations from those indicated, as required to suit field conditions and as approved by Architect.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Wires and Cables:
    - a. American Insulated Wire Corp.; Leviton Manufacturing Co.
    - b. BICC Brand-Rex Company.
    - c. Carol Cable Co., Inc.
    - d. Senator Wire & Cable Company.
    - e. Southwire Company.
  - 2. Connectors for Wires and Cables:
    - a. AMP Incorporated.
    - b. General Signal; O-Z/Gedney Unit.
    - c. Monogram Co.; AFC.
    - d. Square D Co.; Anderson.
    - e. 3M Company; Electrical Products Division.

**2.2 BUILDING WIRES AND CABLES**

- A. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Wire and Insulation Applications" Article.
- B. Rubber Insulation Material: Comply with NEMA WC 3.
- C. Thermoplastic Insulation Material: Comply with NEMA WC 5.
- D. Ethylene Propylene Rubber Insulation Material: Comply with NEMA WC 8.
- E. Conductor Material: Copper.
- F. Stranding: Solid conductor for No. 10 AWG and smaller; stranded conductor for larger than No. 10 AWG.
- G. Plenum rated cable for all cables above the ceiling.

**2.3 CONNECTORS AND SPLICES**

- A. UL-listed, factory-fabricated wiring connectors of size, ampacity rating, material, type, and class for application and service indicated. Comply with Project's installation requirements and as specified in Part 3 "Wire and Insulation Applications" Article.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Examine raceways and building finishes to receive wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance of wires and cables. Do not proceed with installation until unsatisfactory conditions have been corrected.

### **3.2 WIRE AND INSULATION APPLICATIONS**

- A. Service Entrance: Type RHW or THWN, in raceway.
- B. Feeders: Type 75C insulation THHN/THWN, in raceway.
- C. Fire-Pump Feeder: Type MI, 3-conductor.
- D. Branch Circuits: Type THHN/THWN, in raceway.
- E. Fire Alarm Circuits: Type THHN/THWN, in raceway.
- F. Class 1 Control Circuits: Type THHN/THWN, in raceway.
- G. Class 2 Control Circuits: Type THHN/THWN, in raceway.
- H. Equipment or any device rated 100 amperes or less, conductor shall be rated 60C as per National Electrical Code.
- I. Equipment or any device rated over 100 amperes, conductor shall be rated 75C as per National Electrical Code.

### **3.3 INSTALLATION**

- A. Install wires and cables as indicated, according to manufacturer's written instructions and NECA's "Standard of Installation."
- B. Remove existing wires from raceway before pulling in new wires and cables.
- C. Pull Conductors: 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.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables, parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Division 16 Section "Basic Electrical Materials and Methods."
- G. Seal around cables penetrating fire-rated elements according to Division 7 Section "Firestopping."
- H. Identify wires and cables according to Division 16 Section "Basic Electrical Materials and Methods."
- I. Identify wires and cables according to Division 16 Section "Electrical Identification."

### **3.4 CONNECTIONS**

- A. Conductor Splices: Keep to minimum.
- B. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.
- C. Use splice and tap connectors compatible with conductor material.
- D. Use oxide inhibitor in each splice and tap connector for aluminum conductors.
- E. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.
- F. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer.
- G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### **3.5 FIELD QUALITY CONTROL**

- A. Testing: On installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
  - 1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
- B. Correct malfunctioning conductors and cables at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

**END OF SECTION**

**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.

- 1. Raceways include the following:
  - a. RMC.
  - b. IMC.
  - c. PVC externally coated, rigid steel conduits.
  - d. PVC externally coated, IMC.
  - e. EMT.
  - f. FMC.
  - g. LFMC.
  - h. LFNC.
  - i. RNC.
  - j. ENT.
  - k. Wireways.
  - l. Surface raceways.
- 2. Boxes, enclosures, and cabinets include the following:
  - a. Device boxes.
  - b. Floor boxes.
  - c. Outlet boxes.
  - d. Pull and junction boxes.
  - e. Cabinets and hinged-cover enclosures.

- B. Related Sections include the following:

- 1. Division 16 Section "Basic Electrical Materials and Methods" for raceways and box supports.
- 2. 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. RMC: Rigid metal conduit.
- H. RNC: Rigid nonmetallic conduit.

**1.4 SUBMITTALS**

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: Include layout drawings showing components and wiring for nonstandard boxes, enclosures, and cabinets.

**1.5 QUALITY ASSURANCE**

- A. Listing and Labeling: Provide raceways and boxes specified in this Section that are listed and labeled.
  - 1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
  - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.
- B. Comply with NECA's "Standard of Installation."
- C. Comply with NFPA 70.

## 1.6 COORDINATION

- A. Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Metal Conduit and Tubing:
    - a. Alflex Corp.
    - b. Anamet, Inc.; Anaconda Metal Hose.
    - c. Anixter Brothers, Inc.
    - d. Carol Cable Co., Inc.
    - e. Cole-Flex Corp.
    - f. Electri-Flex Co.
    - g. Flexcon, Inc.; Coleman Cable Systems, Inc.
    - h. Grinnell Co.; Allied Tube and Conduit Div.
    - i. Triangle PWC, Inc.
    - j. Wheatland Tube Co.
  - 2. Nonmetallic Conduit and Tubing:
    - a. Arnco Corp.
    - b. Cantex Industries; Harsco Corp.
    - c. Certainteed Corp.; Pipe & Plastics Group.
    - d. Cole-Flex Corp.
    - e. Condux International; Electrical Products.
    - f. Electri-Flex Co.
    - g. George-Ingraham Corp.
    - h. Hubbell, Inc.; Raco, Inc.
    - i. Lamson & Sessions; Carlon Electrical Products.
    - j. R&G Sloan Manufacturing Co., Inc.
    - k. Spiraduct, Inc.
    - l. Thomas & Betts Corp.
  - 3. Conduit Bodies and Fittings:
    - a. American Electric; Construction Materials Group.
    - b. Crouse-Hinds; Div. of Cooper Industries.
    - c. Emerson Electric Co.; Appleton Electric Co.
    - d. Hubbell, Inc.; Killark Electric Manufacturing Co.
    - e. Lamson & Sessions; Carlon Electrical Products.
    - f. O-Z/Gedney; Unit of General Signal.
  - 4. Metal Wireways:
    - a. Hoffman Engineering Co.
    - b. Keystone/Rees, Inc.
    - c. Square D Co.

### 2.2 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Rigid Aluminum Conduit: ANSI C80.5.
- C. IMC: ANSI C80.6.
- D. EMT and Fittings: ANSI C80.3.
  - 1. Fittings: Set-screw type.
- E. Fittings: NEMA FB 1; compatible with conduit/tubing materials.

### 2.3 NONMETALLIC CONDUIT AND TUBING

- A. RNC: NEMA TC 2, Schedule 40 or 80 PVC.
- B. RNC Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.

- C. LFNC: UL 1660.
  - 2.4 METAL WIREWAYS**
    - A. Material: Sheet metal sized and shaped as indicated.
    - 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: Screw – cover type flanged-and-gasketed type.
    - E. Finish: Manufacturer's standard enamel finish.
  - 2.5 OUTLET AND DEVICE BOXES**
    - A. Sheet Metal Boxes: NEMA OS 1.
    - B. Cast-Metal Boxes: NEMA FB 1, Type FD, cast box with gasketed cover.
  - 2.6 PULL AND JUNCTION BOXES**
    - A. Small Sheet Metal Boxes: NEMA OS 1.
    - B. Cast-Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.
  - 2.7 ENCLOSURES AND CABINETS**
    - A. 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.
    - B. 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.
- PART 3 - EXECUTION**
- 3.1 EXAMINATION**
    - A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.
  - 3.2 WIRING METHODS**
    - A. Outdoors: Use the following wiring methods:
      - 1. Exposed: Rigid steel.
      - 2. Concealed: Rigid steel.
      - 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 3R .
    - B. Indoors: Use the following wiring methods:
      - 1. Exposed: EMT.
      - 2. Concealed: EMT.
      - 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): FMC; except in wet or damp locations, use LFMC.
      - 6. Damp or Wet Locations: Rigid steel conduit.
      - 7. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
        - a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.
  - 3.3 INSTALLATION**
    - A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.
    - B. Minimum Raceway Size: 3/4-inch trade size (DN21).

- C. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.
- D. 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.
- E. Install raceways level and square and at proper elevations. Provide adequate headroom.
- F. Complete raceway installation before starting conductor installation.
- G. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."
- H. Use temporary closures to prevent foreign matter from entering raceways.
- I. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
- J. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.
- K. Use raceway fittings compatible with raceways and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, unless otherwise indicated.
- L. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.
- M. Raceways Embedded in Slabs (Must be indicated on drawings to be embedded. Please notify Engineer if required but not shown): Install in middle third of slab thickness where practical, and leave at least 1-inch (25-mm) concrete cover.
  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 (DN27) parallel to or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
  4. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
- N. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.
  1. Run parallel or banked raceways together, on common supports where practical.
  2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- O. Join raceways with fittings designed and approved for the purpose and make joints tight.
  1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
  2. Use insulating bushings to protect conductors.
- P. Tighten set screws of threadless fittings with suitable tools.
- Q. Terminations: Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against the box. Where terminations are not secure with 1 locknut, use 2 locknuts: 1 inside and 1 outside the box.
- R. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipple so no threads are exposed.
- S. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel 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 the pull wire.
- T. Telephone and Signal System Raceways, 4-Inch Trade Size (DN53) and Smaller: In addition to the above requirements, install raceways in maximum lengths of 150 feet (45 m) and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
- U. Install raceway sealing fittings according to manufacturer's written instructions. Locate fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a

finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as the boundaries of refrigerated spaces.
  2. Where otherwise required by NFPA 70.
- V. 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 the 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 flush plugs flush with floor for future equipment connections.
- W. Flexible Connections: Use maximum of 6 feet (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 liquidtight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.
- X. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in a nonmetallic sleeve.
- Y. Do not install aluminum conduits embedded in or in contact with concrete.
- Z. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.
- AA. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying the raceways to receptacle or fixture ground terminals.
1. Select each surface raceway outlet box, to which a lighting fixture is attached, of sufficient diameter to provide a seat for the fixture canopy.
  2. Where a surface raceway is used to supply a fluorescent lighting fixture having central-stem suspension with a backplate and a canopy (with or without extension ring), no separate outlet box is required.
  3. Provide surface metal raceway outlet box, and the backplate and canopy, at the feed-in location of each fluorescent lighting fixture having end-stem suspension.
  4. Where a surface metal raceway extension is made from an existing outlet box on which a lighting fixture is installed, no additional surface-mounted outlet box is required. Provide a backplate slightly smaller than the fixture canopy.
- BB. Set floor boxes level and adjust to finished floor surface.
- CC. Set floor boxes level and trim after installation to fit flush to finished floor surface.
- DD. Install hinged-cover enclosures and cabinets plumb. Support at each corner.
- 3.4 PROTECTION**
- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure coatings, finishes, and cabinets are without damage or deterioration at the 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.
- 3.5 CLEANING**
- A. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

**END OF SECTION**

**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 receptacles, connectors, switches, and finish plates.

**1.3 DEFINITIONS**

- A. GFI: Ground-fault circuit interrupter.
- B. TVSS: Transient voltage surge suppressor.

**1.4 SUBMITTALS**

- A. Product Data: For each product specified.
- B. Shop Drawings: Legends for receptacles and switch plates.
- C. Samples: For devices and device plates for color selection and evaluation of technical features.
- D. Maintenance Data: For materials and products to include in maintenance manuals specified in Division 1.

**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.
- B. Comply with NEMA WD 1.
- C. Comply with NFPA 70.

**1.6 COORDINATION**

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
- B. Coordinate with pool contractor for special receptacles.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Wiring Devices:
    - a. Bryant Electric, Inc.
    - b. Eagle Electric Manufacturing Co., Inc.
    - c. GE Company; GE Wiring Devices.
    - d. Hubbell, Inc.; Wiring Devices Div.
    - e. Killark Electric Manufacturing Co.
    - f. Leviton Manufacturing Co., Inc.
    - g. Pass & Seymour/Legrand; Wiring Devices Div.
    - h. Pyle-National, Inc.; an Amphenol Co.

**2.2 RECEPTACLES**

- A. Straight-Blade and Locking Receptacles: Heavy-Duty grade. The device shall be 20-ampere, 125-volts, Nema configuration 5-20R, back and side wired.
- B. Special Receptacles for NEMA configuration refer to Manufacturer specs.
- C. GFI Receptacles: Feed-through type, with integral NEMA WD 6, Configuration 5-20R duplex receptacle arranged to protect connected downstream receptacles on same circuit. Design units for installation in a 2-3/4-inch- (70-mm-) deep outlet box without an adapter. Device shall have an indicator light.
- D. Isolated-Ground Receptacles: Equipment grounding contacts connected only to the green grounding screw terminal of the device with inherent electrical isolation from mounting strap.  
**Device shall be white finish with the orange symbol.**
  - 1. Devices: Listed and labeled as isolated-ground receptacles.
  - 2. Isolation Method: Integral to receptacle construction and not dependent on removable parts.

## 2.3 SWITCHES

### A. General

1. Switches shall be toggle or decorative rocker type as indicated herein.. The body of the switch shall be made of an arc-resistant thermoset material. All toggle switch handles shall be constructed of a thermoplastic material. All rocker switch handles shall be constructed of a thermoset material. All wall switches shall be of the quiet AC type.
  1. Switches shall be SPST, DPST, 3-way or 4-way as indicated on the Drawings.
  2. Switch color shall be white unless noted otherwise. Coordinate with Architect.

### B. Specification Grade

1. Specification Grade switches shall be toggle type. The contact arms shall be made of one-piece copper alloy material. The switch shall include a green ground screw attached to the mounting strap. The switch shall be 20-ampere, 120/277-volts AC, horsepower rated, back and side-wired.

### C. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible and electromagnetic noise filters.

1. Control: Continuously adjustable slide, toggle, or rotary knob. Single-pole or three-way switch to suit connections.
2. Incandescent Lamp Dimmers: Modular, 120 V, 60 Hz with continuously adjustable slide with "on/off" switch; single pole with soft tap or other quiet switch; electromagnetic filter to eliminate noise, RF, and TV interference; and 5-inch (130-mm) wire connecting leads. Dimmer to be sized per circuit load.

## 2.4 WALL PLATES(All wall plates)

### A. For all single and combination types match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.04-inch- (1-mm-) thick, Type 302, satin-finished stainless steel.
3. Material for Unfinished Spaces: stainless steel.

## 2.5 FLOOR SERVICE FITTINGS

- A. Power Receptacle: NEMA WD 6, Configuration 5-20R, gray finish, unless otherwise indicated.
- B. Signal Outlet: Blank cover with bushed cable opening, unless otherwise indicated.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install devices and assemblies plumb and secure.
- B. Install wall plates when painting is complete.
- C. Install wall dimmers to achieve indicated rating after derating for ganging as instructed by manufacturer.
- D. Do not share neutral conductor on load side of dimmers.
- E. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- F. Protect devices and assemblies during painting.
- G. Adjust locations at which floor service outlets and telephone/power service poles are installed to suit arrangement of partitions and furnishings.

### 3.2 IDENTIFICATION

- A. Comply with Division 16 Section "Electrical Identification."
- B. Comply with Division 16 Section "Basic Electrical Materials and Methods."
  1. Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate.

2. Receptacles: Identify panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

### **3.3 CONNECTIONS**

- A. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.
- B. Isolated-Ground Receptacles: Connect to isolated-ground conductor routed to designated isolated equipment ground terminal of electrical system.
- C. Tighten electrical connectors and terminals according to manufacturers published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A and UL 486B.

### **3.4 FIELD QUALITY CONTROL**

- A. Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.
- B. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- C. Replace damaged or defective components.

### **3.5 CLEANING**

- A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

**END OF SECTION**

**SECTION 16190  
SUPPORTING DEVICES**

**PART 1 - GENERAL**

**1.1 RELATED REQUIREMENTS**

- A. The General Provisions, Supplemental General Provisions, Special Provisions and Division 1 Specification sections, apply to work covered by this Section.
- B. Comply with Division 16 Sections, as applicable. Refer to other Division for coordination of work.

**1.2 SCOPE OF WORK**

- A. Provide labor, material, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of supporting devices, including related systems and accessories.

**PART 2 - PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURERS**

- B. Unistrut Corp.
- C. B-Line Systems, Inc.
- D. Midland Ross-Kindorf

**2.2 MATERIALS**

- A. Suspension Hangers
  - 1.1 Suspension hangers for individual conduit runs shall be zinc plated formed steel type.
- B. Vertical Supports
  - 1.1 Malleable iron one hole pipe straps shall be used for vertical runs.
- C. Clamps
  - 1.1 Beam clamps shall be used for bar joists and beams.
- D. Anti-Vibration Hangers

1.1 Anti-vibration hangers shall be combination type having a double deflection neoprene element in series with a steel coil spring; double deflection of 0.30"; steel coil spring shall be selected from a 1" static deflection series with a minimum additional travel to solid of 1/2"; spring diameters shall be large enough to permit 15 degree angular misalignment of the rod connecting the hanger to the ceiling support without rubbing the hanger box.

**2.3 Light Fixture Hangers**

- A. Refer to Section 16500

Corrosive Areas: PVC; at factory apply a minimum of 10-mil-thick PVC coating, bonded to metal, inside and outside.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Hangers
  - 1 Approved hangers and stiff leg supports shall be installed in quantity and size as required to carry the weight of raceway and contents and shall be arranged to prevent vibration transmission to the building and allow for raceway movement.
  - 2 Hangers shall be supported by means of uncoated solid steel rods which are threaded to allow vertical adjustments. Lock nuts shall be provided in sufficient number and location to lock all rod adjustments permanently at the adjusted height. Two lock nuts shall be used unless the nut tightens against a threaded socket. Minimum rod diameters shall be as follows:

NOMINAL CONDUIT SIZE	ROD DIAMETER
1/2" through 2"	1/4"
2-1/2" through 3"	3/8"
4" and 5"	1/2"
  - 3 Hanger spacing shall be as required for proper and adequate support raceway, but in no case shall be less than one hanger per 8'-0" of raceway length except that conduit

less than 1" diameter shall be supported at least every 6'-0".

4 Where numerous conduits are run parallel to one another, they may be supported from a trapeze type hanger arrangement with strut bottom.

5 Anti-vibration type hangers shall be provided for equipment as required to minimize vibration and/or as directed by the Architect/Engineer.

**B. Supports**

1 Support of hangers shall be by means of sufficient quantities of individual after set steel expansion shields, or beam clamps attached to structural steel.

2 Stiff-legs shall be furnished and installed in cases where support from overhead structure is not possible.

3 Ceiling mounted lighting fixtures shall be supported from the building structure at two opposite corners. The Contractor shall provide fixture hangers to properly interface with the ceiling system.

4 Furnish and install complete any additional structural support steel, brackets, fasteners, etc., as required to adequately support all raceway and equipment.

5 Support of hangers from concrete slabs shall be by means of sufficient quantity of "U" brackets attached with after set expansion shields and bolts.

6 Support of hangers from concrete tees shall be by means of sufficient quantity of angle iron brackets attached with after set expansion shields and bolts.

**END OF SECTION**

**SECTION 16440  
DISCONNECT SWITCHES**

**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- A. The General Provisions, Supplemental General Provisions, Special Provisions and Division 1 Specification sections, apply to work covered by this Section.

**1.2 SCOPE OF WORK**

- A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of disconnect switches, including all related systems and accessories.

**1.3 SUBMITTALS**

- A. Submit product data and shop drawings in accordance with Division 1 for products specified under PART 2 - PRODUCTS.
- B. Provide outline drawings with dimensions, and equipment ratings for voltage, amperage, horsepower and short circuit.
- C. Provide designations for each disconnect. RE: to section 16075.

**1.4 REFERENCE STANDARDS**

- A. Switches shall be manufactured in accordance with the following standards:
  - 1. UL 98 - Enclosed and Dead Front Switches
  - 2. NEMA KS1 - Enclosed Switches
  - 3. NEMA 250 - Enclosures for Electrical Equipment

**PART 2 PRODUCTS**

**2.1 MANUFACTURER**

- A. GE
- B. Square D Co.
- C. Siemens
- D. Eaton

**2.2 GENERAL**

- A. Switches shall be heavy duty type.

**2.3 SWITCH INTERIOR**

- A. Switches shall have switch blades which are visible when the switch is OFF and the cover is open.
- E. Lugs shall be copper and front removable and UL listed for 60°C or 75°C conductors 30-100 ampere, 75°C conductors 200 ampere and up.
- F. Current carrying parts shall be plated to resist corrosion.
- G. Switches shall have removable arc suppressor to facilitate easy access to line side lugs.
- H. Switches shall have provisions for a field installable electrical interlock.

**2.4 SWITCH MECHANISM**

- A. Switch operating mechanism shall be quick-make, quick-break such that, during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has started.
- B. The operating handle shall be an integral part of the box, not the cover.
- C. Provisions for padlocking the switch in the OFF position with at least three padlocks shall be provided.
- D. The handle position shall travel at least 90° between OFF and ON positions to clearly distinguish and indicate handle position.
- E. Switches shall have a dual cover interlock mechanism to prevent unintentional opening of the switch cover when the switch is ON and prevent turning the switch ON when the cover is open. The cover interlock mechanism shall have an externally operated override but the override shall not permanently disable the interlock mechanism. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

**2.5 SWITCH ENCLOSURES**

- A. Switch covers shall be attached with welded pin-type hinges (Type 1) or top-hinged, attached with removable screws and securable in the open position (Type 3R).
- B. The enclosure shall be finished with gray baked enamel paint which is electrodeposited on cleaned,

phosphate pre-treated steel (Type 1) or gray baked enamel paint which is electrodeposited on cleaned, phosphate pre-treated galvanized steel (Type 3R).

- C. The enclosure shall have ON and OFF markings stamped into the cover.
- D. The operating handle shall be provided with a dual colored, red/black position indication.
- E. Switches shall have provisions to accept up to three 3/8" hasp padlocks to lock the operating handle in the OFF position.
- I. Tangential knockouts shall be provided to facilitate ease of conduit entry (Type 1).
- J. Type 3R enclosure shall contain no knockouts. Supply watertight hubs.
- K. Type 4x shall be stainless steel enclosure with no knockouts. Supply watertight hubs.

## **2.6 SWITCH RATINGS**

- A. Switches shall be horsepower rated.
- B. The UL listed short circuit current rating of the switches shall be: 200,000 rms symmetrical amperes when used with or protected by Class R or Class J fuses 30-600 ampere employing appropriate fuse rejection schemes.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- A. Install disconnect switches where indicated shown or not shown.
- B. Install fuses in fusible disconnect switches.

**END OF SECTION**

**SECTION 16442  
PANELBOARDS**

**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 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.
  
- B. Related Sections include the following:
  - 1. Division 16 Section "Fuses."

**1.3 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.
- F. TVSS: Transient voltage surge suppressor.

**1.4 SUBMITTALS**

- A. Product Data: For each type of panelboard, overcurrent protective device, TVSS 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.
  - 2. Wiring Diagrams: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.
- C. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in "Quality Assurance" Article.
- D. Field Test Reports: Submit written test reports and include the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- E. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.
- F. 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.

**1.5 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

#### **1.6 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.

#### **1.7 EXTRA MATERIALS**

- A. Keys: [SIX] 6 spares of each type of panelboard cabinet lock.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
    - a. GE
    - b. Square D Co.
    - c. Siemens
    - d. Eaton

#### **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.
  2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
  3. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.
- 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: With transparent protective cover, mounted inside metal frame, inside panelboard door.
- F. Bus: Hard-drawn copper, 98 percent conductivity.
- G. Main and Neutral Lugs: Copper mechanical type suitable for use with conductor material.
- H. Equipment Ground Bus: Copper and 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. Isolated Equipment Ground Bus: Copper and adequate for branch-circuit equipment ground conductors; insulated from box.
- K. Extra-Capacity Neutral Bus: Copper neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.
- L. Split Bus: Vertical buses divided into individual vertical sections.
- M. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
- N. Gutter Barrier: Arrange to isolate individual panel sections.
- O. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.
- P. Feed-through Lugs: Copper mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

#### **2.3 PANELBOARD SHORT-CIRCUIT RATING**

- A. Fully rated to interrupt symmetrical short-circuit current available at terminals.
- 2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS**
- A. Branch Overcurrent Protective Devices: Plug-in or 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: Plug-in or 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. Electronic Trip Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
      - a. Instantaneous trip.
      - b. Long- and short-time pickup levels.
      - c. Long- and short-time time adjustments.
      - d. Ground-fault pickup level, time delay, and  $I^2t$  response.
    3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
    4. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
    5. GFCI Circuit Breakers: Single- and two-pole configurations with [5] [30]-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.
    3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
  - C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Install panelboards and accessories according to NEMA PB 1.1.
- 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. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

### **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] [Electrical Identification."
- B. 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 continuity of each circuit.
- B. Testing: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
  - 1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
  - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- C. Balancing Loads: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes as follows:
  - 1. Measure as directed during period of normal system loading.
  - 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data-processing, computing, transmitting, and receiving equipment.
  - 3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
  - 4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

### **3.5 ADJUSTING**

- A. Set field-adjustable switches and circuit-breaker trip ranges.

### **3.6 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**

**SECTION 16475  
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. Fuses.

**1.3 SUBMITTALS**

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each fuse type specified.
- C. Field test reports indicating and interpreting test results.
- D. Maintenance data for tripping devices to include in the operation and maintenance manual specified in Division 1.

**1.4 QUALITY ASSURANCE**

- A. Source Limitations: Obtain fuses from one source and by a single manufacturer.
- B. Comply with NFPA 70 for components and installation.
- C. Listing and Labeling: Provide fuses specified in this Section that are listed and labeled.
  - 1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
  - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

**1.5 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
  - 1. Spare Fuses: Furnish quantity equal to 20 percent of each fuse type and size installed, but not less than 1 set of 3 of each type and size.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering fuses that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide fuses by one of the following:
  - 1. Cooper Industries, Inc.; Bussmann Div.
  - 2. Eagle Electric Mfg. Co., Inc.
  - 3. Ferraz Corp.
  - 4. General Electric Co.; Wiring Devices Div.
  - 5. Gould Shawmut.
  - 6. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

**2.2 CARTRIDGE FUSES**

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class as specified or indicated; current rating as indicated; voltage rating consistent with circuit voltage.

**2.3 SPARE FUSE CABINET**

- A. Cabinet: Wall-mounted, 0.05-inch- (1.27-mm-) thick steel unit with full-length, recessed piano-hinged door with key-coded cam lock and pull.
  - 1. Size: Adequate for orderly storage of spare fuses specified with 15 percent spare capacity minimum.
  - 2. Finish: Gray, baked enamel.
  - 3. Identification: Stencil legend "SPARE FUSES" in 1-1/2-inch (40-mm) letters on door.
  - 4. Fuse Pullers: For each size fuse.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Examine utilization equipment nameplates and installation instructions to verify proper fuse locations, sizes, and characteristics.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

**3.2 FUSE APPLICATIONS**

- A. Motor Branch Circuits: Class RK1, time delay.
- B. Other Branch Circuits: Class RK5, non-time delay.

**3.3 INSTALLATION**

- A. Install fuses in fusible devices as indicated. Arrange fuses so fuse ratings are readable without removing fuse.
- B. Install spare fuse cabinet where indicated.

**3.4 IDENTIFICATION**

- A. Install typewritten labels on inside door of each fused switch to indicate fuse replacement information.

**END OF SECTION**

**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 SUMMARY**

- A. This Section includes interior lighting fixtures, lighting fixtures mounted on exterior building surfaces, lamps, ballasts, emergency lighting units, and accessories.

- B. Related Sections include the following:

**1.3 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 laboratory tests for fixtures and lamps for photometric performance.
3. Emergency lighting unit battery and charger.
4. Fluorescent and high-intensity-discharge ballasts.
5. 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. Coordination Drawings: Reflected ceiling plans and sections drawn to scale and coordinating fixture installation with ceiling grid, ceiling-mounted items, and other components in the vicinity. Include work of all trades that is to be installed near lighting equipment.

- D. Product Certificates: Signed by manufacturers of lighting fixtures certifying that products comply with requirements.

- E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

- F. Maintenance Data: For lighting fixtures to include in maintenance manuals specified in Division 1.

**1.4 QUALITY ASSURANCE**

- A. Fixtures, Emergency Lighting Units, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by an acceptable to authorities having jurisdiction.

- B. Comply with NFPA 70.

- C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

**1.5 COORDINATION**

- A. Fixtures, Mounting Hardware, and Trim: Coordinate layout and installation of lighting fixtures with ceiling system and other construction.

**1.6 WARRANTY**

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

- B. Special Warranties for Fluorescent Ballasts: Written warranty, executed by manufacturer agreeing to replace fluorescent ballasts that fail in materials or workmanship within specified warranty period.
  - 1. Special Warranty Period for Electronic Ballasts: Five years from date of manufacture, but not less than four years from date of Substantial Completion.

#### **1.7 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

### **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 Interior Lighting Fixture Schedule at the end of Part 3.
- B. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Interior Lighting Fixture Schedule in the plans. Submit Manufacturers as is in the Lighting Fixture Schedule or Equal. Submit Equal Manufacturers 10 days prior to bidding day for approval. For Equal Manufacturers submit lighting calculation for each equal fixture submitted for approval.

#### **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.
- D. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:
  - 1. White Surfaces: 85 percent.
  - 2. Specular Surfaces: 83 percent.
  - 3. Diffusing Specular Surfaces: 75 percent.
  - 4. Laminated Silver Metallized Film: 90 percent.
- E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or annealed crystal glass, unless otherwise indicated.
  - 1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.
  - 2. Lens Thickness: 0.125 inch (3 mm) minimum, unless greater thickness is indicated.

#### **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.
- B. Electronic Ballasts for Linear Lamps: Unless otherwise indicated, features include the following, besides those in "General Requirements" Paragraph above:
  - 1. Certified Ballast Manufacturer Certification: Indicated by label.
  - 2. Encapsulation: Without voids in potting compound.
  - 3. Parallel Lamp Circuits: Multiple lamp ballasts connected to maintain full light output on surviving lamps if one or more lamps fail.

- 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.
  4. Flicker: Less than 5 percent.
  5. Lamp Current Crest Factor: Less than 1.7.
  6. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.
  7. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
- D. Ballasts for Compact Lamps in Nonrecessed Fixtures: Unless otherwise indicated, additional features include the following:
  1. Power Factor: 90 percent, minimum.
  2. Ballast Coil Temperature: 65 deg C, maximum.
  3. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.
  4. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

## 2.4 EXIT SIGNS

- A. General Requirements: Comply with UL 924 and the following:
  1. Sign Colors and Lettering Size: Comply with authorities having jurisdiction.
- B. Internally Lighted Signs: As follows:
  1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum rated lamp life.

## 2.5 EMERGENCY LIGHTING UNITS

- A. General Requirements: Self-contained units. Comply with UL 924. Units include the following features:
  1. Battery: Sealed, maintenance-free, lead-acid type with minimum 5-year nominal life and special warranty.
  2. Charger: Fully automatic, solid-state type with sealed transfer relay.
  3. Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.

## 2.6 EMERGENCY FLUORESCENT POWER SUPPLY UNIT

- A. Internal Type: Self-contained, modular, battery-inverter unit factory mounted within fixture body. Comply with UL 924.
  1. Test Switch and Light-Emitting Diode Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
  2. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum 5-year nominal life.
  3. Charger: Fully automatic, solid-state, constant-current type.
  4. Operation: Relay automatically energizes lamp from unit when normal supply circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamp, and battery is automatically recharged and floated on charger.

## 2.7 LAMPS

- A. Noncompact Fluorescent Lamp Life: Rated average is 20,000 hours at 3 hours per start when used on rapid-start circuits.

## 2.8 FINISHES

- A. Fixtures: Manufacturer's standard, unless otherwise indicated.

## **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: Do not use grid for support.
  - 1. Install a minimum of two ceiling support system wires for each fixture. Locate not more than 6 inches (150 mm) from fixture corners.
  - 2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner.
  - 3. 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. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### **3.3 FIELD QUALITY CONTROL**

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Advance Notice: Give dates and times for field tests.
- C. Provide instruments to make and record test results.
- D. 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 battery source and retransfer to normal.
  - 4. Report results in writing.
- E. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.
- F. 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.
- B. Adjust aimable fixtures to provide required light intensities.

**END OF SECTION**

**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 and lamps.
- B. Related Sections include the following:
  - 1. Division 16 Section "Interior Lighting" for interior fixtures, lamps, ballasts, emergency lighting units, and accessories; and for exterior luminaires normally mounted on buildings.

**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.
  - 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.
- B. Product Certificates: Signed by manufacturers of lighting units certifying that products comply with requirements.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- D. 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 acceptable to authorities having jurisdiction
- B. Comply with ANSI C2.
- C. Comply with NFPA 70.

**1.6 WARRANTY**

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents. Warranty one labor.

**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 Exterior Lighting Unit Schedule at the end of Part 3.
- B. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Interior Lighting Fixture Schedule in the plans. Submit Manufacturers as is in the Lighting Fixture Schedule or Equal. Submit Equal Manufacturers 10 days prior to bidding day for approval. For Equal Manufacturers submit lighting calculation for each equal fixture submitted for approval.

## 2.2 LUMINAIRES

- A. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- B. Metal Parts: Free from burrs, sharp corners, and edges.
- C. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.
- D. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- E. 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.
- F. Exposed Hardware Material: Stainless steel.
- G. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.
- H. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:
  - 1. White Surfaces: 85 percent.
  - 2. Specular Surfaces: 83 percent.
  - 3. Diffusing Specular Surfaces: 75 percent.
- I. Lenses and Refractors: Materials as indicated. Use heat- and aging-resistant, resilient gaskets to seal and cushion lens and refractor in luminaire doors.
- J. Photoelectric Relays: As follows:
  - 1. Contact Relays: Single throw, arranged to fail in the on position and factory set to turn light unit on at 1.5 to 3 fc (16 to 32 lx) and off at 4.5 to 10 fc (48 to 108 lx) with 15-second minimum time delay.
  - 2. Relay Mounting: In luminaire housing.
- K. High-Intensity-Discharge Ballasts: Comply with ANSI C82.4. Constant wattage autotransformer or regulating high-power-factor type, unless otherwise indicated.
  - 1. Single-Lamp Ballasts: Minimum starting temperature of minus 40 deg C.
  - 2. Open-circuit operation will not reduce average life.
  - 3. 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.
  - 4. Noise: Uniformly quiet operation, with a noise rating of B or better.
- L. Lamps: Comply with the standard of the ANSI C78 series that is applicable to each type of lamp. Provide luminaires with indicated lamps of designated type, characteristics, and wattage. Where a lamp is not indicated for a luminaire, provide medium wattage lamp recommended by manufacturer for luminaire.

## PART 3 - EXECUTION

### **3.1 CONNECTIONS**

- A. Ground equipment.
  - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Ground metal poles/support structures according to Division 16 Section "Grounding."
  - 1. Nonmetallic Poles: Ground metallic components of lighting units and foundations. Connect luminaires to grounding system with No. 6 AWG conductor.

### **3.2 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. Tests and Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source, and as follows:

### **3.3 CLEANING AND ADJUSTING**

- A. Clean units after installation. Use methods and materials recommended by manufacturer.

**END OF SECTION**

**SECTION 16721  
FIRE ALARM/LIFE SAFETY SYSTEM**

**PART 1 - GENERAL**

**1.1 RELATED REQUIREMENTS**

- A. The General Provisions, Supplemental General Provisions, Special Provisions and Division 1 Specification Sections apply to Work covered by this Section.
- B. Comply with other Division 16 Sections, as applicable. Refer to other Divisions for coordination of the Work.

**1.2 SCOPE OF WORK**

- A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing additional devices for the shell building fire alarm system, including all related systems and accessories.
- B. Replace existing fire alarm devices, reusing existing locations. Fire Alarm contractor is responsible to comply at existing areas. Fire Alarm contractor is responsible to comply with ADA fire alarm code. Include all cost in bas bid.
  - 1. Fire alarm control panel
  - 2. Remote Annunciator
  - 3. Addressable or conventional manual fire alarm stations.
  - 4. Addressable analog and conventional area smoke detectors.
  - 5. Conventional beam detectors.
  - 6. Addressable analog and conventional duct smoke detectors.
  - 7. Addressable analog and conventional heat detectors.
  - 8. Sprinkler water flow alarm switches.
  - 9. Audible notification appliances; bells, horns, chimes.
  - 10. Visual notification appliances; strobes.
  - 11. Central station alarm connection control.
  - 12. Air handling systems shutdown control.
  - 13. Stair pressurization system startup control.
  - 14. Magnetic door holder release.
  - 15. Dry pipe sprinkler release valve/deluge valve control.
  - 16. Sprinkler supervisory switches and tamper switch supervision.
  - 17. Dry pipe sprinkler release valve/deluge valve supervision.
  - 18. Emergency generator supervision.
  - 19. Fire pump supervision.
  - 20. Battery standby.
  - 21. System shall activate the overhead gates. Provide all accessories for an active system.

**1.3 SUBMITTALS**

- A. Submit product data and shop drawings in accordance with Division 1 for products specified under PART 2 - PRODUCTS. Shop drawings shall be generated by the Fire Alarm Contractor without the Engineers plans.
- B. The submittal data shall include, but not necessarily be limited to, the following:
  - 1 Complete bill of material indicating quantity, part numbers and brief description.
  - 2 Data sheets for all products. If multiple models are shown on the same data sheet, highlight the specific model used.
  - 3 Provide drawing with all devices.
  - 4 Provide single line riser diagram showing all equipment and type, number and size of all conductors.

**1.4 REFERENCE STANDARDS**

- A. The fire alarm system devices specified herein shall be designed, manufactured, installed and tested according to the latest version of the following standards:
  - 1 National Fire Protection Association Standards
  - 1 NFPA 70 - National Electric Code (NEC), Articles 725 & 760.
  - 2 NFPA 71 - Central Station Signaling Systems

- 3 NFPA 72 - National Fire Alarm Code (NFAC)
- 4 NFPA 92A - Smoke Control Systems
- 5 NFPA 101 - Life Safety Code
- 2 Underwriters Laboratories, Inc.
- 1 UL 38 - Manually Activated Signaling Boxes
- 2 UL 228 - Door Holders for Fire Protective Signaling Systems
- 3 UL 268 - Smoke Detectors for Fire Protective Signaling Systems
- 4 UL268A - Smoke Detectors for Duct Applications
- 5 UL 346 - Waterflow Indicators for Fire Protective Signaling Systems
- 6 UL 464 - Audible Signaling Appliances
- 7 UL 864/UOJZ/APOU - Control Units for Fire Protective Signaling Systems
- 8 UL 1481 - Power Supplies for Fire Protective Signaling Systems
- 9 UL 1638 - Visual Signaling Appliances
- 10 UL 1711 - Amplifiers for Fire Protective Signaling Systems
- 11 UL 1971 - Standard for Fire Protective Signaling Systems
- 3 Americans with Disabilities Act (ADA)
- 4 Local and State Building Codes
- 5 Local Authorities Having Jurisdiction (LAHJ)

**1.5 QUALITY ASSURANCE**

- A. The fire alarm system devices shall be listed and labeled by Underwriters Laboratories, Inc. for use in fire protective signaling system.
- B. The Installing Contractor shall be factory authorized and trained and shall be NICET certified in the sub-field of Fire Alarm Systems, for the engineering and technical installation and supervision of the system. This certification shall be Level III for engineering and Level II for technical installation and supervision. Proof of certification shall be provided. All work shall be performed by skilled technicians, under the supervision and direction of the designated NICET engineering technician, all of whom shall be properly trained and qualified for the work.
- C. The fire alarm contractor shall not sub out portion of the work. The fire alarm shall be responsible to complete the job.
- D. Submission to Authority Having Jurisdiction: Submit copies of State Certificate as required by State Fire Marshall. Provide copy with operating and maintenance manual.

**1.6 QUALIFICATIONS**

- 1. The fire alarm contractor, as a business entity, shall be an authorized and designated representative of the equipment manufacturer and shall have been actively engaged in the business of selling, installation and servicing fire alarm systems for a period of at least (5) years prior to the bid date.
- 2. The fire alarm contractor shall have an office within 75 miles of the job site staffed with trained technicians who are qualified to manage the installation, to be responsible that the system is installed as submitted, to conduct system start-up, to instruct the project coordinators representatives and local authorities in the proper operation of the system, and to provide service throughout the warranty period. 3. The fire alarm contractor **SHALL NOT HAVE** any grievances or complaints on record regarding workmanship, code compliance, or service response with either the project coordinator, Architect, Engineer, Owner or the State Fire Marshals office. A contractor that has any prior finding(s) of a Fire Alarm license violation or has any litigation in process with the State Fire Marshal is **unacceptable**.
- 3. The fire alarm contractor shall be an active installer on the approved manufacturer for a minimum of 5 years.

**1.7 WARRANTY**

Warranty of all control equipment, sensors, I/O modules and all other peripherals and of materials, installation and workmanship shall be for one (1) year from date of acceptance.

2.The Contractor shall guarantee all wiring and raceways to be free from inherent mechanical or electrical defects for one (1) year from date of final acceptance.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURER**

- A. SILNET KNIGHT

## 2.2 CIRCUITING GUIDELINES

- A. Each addressable analog loop shall be circuited as shown on the drawings but device loading in not to exceed 80% of loop capacity in order to leave for space for future devices. The loop shall have Class A B operation. When it is necessary to interface conventional initiating devices provide intelligent input modules to supervise Class A B zone wiring. The audio system components shall be an integral part of the fire alarm system control panel.
- B. Audio Amplifiers
  - 1 Each audio power amplifier shall have integral audio signal de-multiplexers, allowing the amplifier to select any digitized audio channels. The channel selection shall be directed by the system software. Multiple and different audio signals shall be able to be broadcast simultaneously from the same system network node.
  - 2 Each amplifier output shall include a dedicated, supervised speaker circuit which is suitable for connection of emergency speaker appliances. Each amplifier shall also include a notification appliance circuit for connection of visual (strobe) appliances. This circuit shall be fully programmable and it shall be possible to define the circuit for the support of audible, visible, or ancillary devices.
  - 3 Standby audio amplifiers shall be provided that automatically sense the failure of a primary amplifier, and automatically program themselves to select and de-multiplex the same audio information channel of the failed primary amplifier, and fully replace the function of the failed amplifier.
  - 4 In the event of a total loss of audio data communications, all amplifiers will default to the local "EVAC" tone generator channel. If the local panel has an alarm condition, then all amplifiers will sound the EVAC signal on their connected speaker circuits.
  - 5 In the event of a loss of the fully digitized, multiplexed audio riser, the audio amplifiers shall automatically default to an internally generated alarm tone.
  - 6 Audio amplifiers shall automatically detect a short circuit condition on the connected speaker circuit wiring, and shall inhibit itself from driving into that short circuit condition.

## 2.3 DETECTORS

- A. General
  - 1 Detectors shall be capable of full digital communications using both broadcast and polling protocol. Each detector shall be capable of performing independent fire detection algorithms. The fire detection algorithm shall measure sensor signal dimensions, time patterns and combine different fire parameters to increase reliability and distinguish real fire conditions from unwanted deceptive nuisance alarms. Signal patterns that are not typical of fires shall be eliminated by digital filters.
  - 2 Detectors shall have an integral microprocessor capable of making alarm decisions based on fire parameter information stored in the detector head. Distributed intelligence shall improve response time by decreasing the data flow between detector and loop controller. Detectors not capable of making independent alarm decisions shall not be acceptable. Maximum total loop response time for detectors shall be 0.5 seconds.
  - 3 Detectors shall have a separate means of displaying communication and alarm status. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. Both LEDs on steady shall indicate alarm-standalone mode status. Both LEDs shall be visible through a full 360 degree viewing angle.
  - 4 Detectors shall be capable of identifying diagnostic codes to be used for system maintenance. The diagnostic codes shall be stored at the detector.
  - 5 Detectors shall be capable of transmitting pre-alarm and alarm signals in addition to the normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each detector shall be individually programmable to operate at various sensibility settings.
  - 6 The detector microprocessor shall contain an environmental compensation algorithm which identifies and sets ambient "environmental thresholds." The microprocessor shall continually monitor the environmental impact of temperature, humidity, other contaminants

as well as detector aging. The process shall employ digital compensation to adapt the detector to both long term and short term environmental changes. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches the allowable environmental compensation value. Differential sensing algorithms shall maintain a constant differential between selected detector sensitivity and the "learned" base line sensitivity. The base line sensitivity information shall be permanently stored at the detector.

- 7 The detector and loop controller shall provide increased reliability and inherent survivability through intelligent conventional operation. The device shall automatically change to stand alone, conventional device operation in the event of a loop controller polling communications failure. In the standalone detector mode, the detector shall continue to operate using sensitivity and environmental compensation information, stored in its microprocessor at the time of communications failure. The loop controller shall monitor the loop and activate a loop alarm if a detector reaches its alarm sensitivity threshold.
- 8 Detectors shall be capable of automatic electronic addressing and/or custom addressing. Devices using DIP or rotary switches for addressing, either in the base or on the detector shall not be acceptable.
- 9 Detectors shall be suitable for operation in the following environment:
  - 1 Temperature: 32°F to 120°F
  - 2 Humidity: 0-93% RH, non-condensing
  - 3 Elevation: Up to 6,000 ft.

**B. Photoelectric Smoke Detectors**

- 1 Addressable intelligent photoelectric smoke detectors shall be provided as indicated on the Drawings. The detector shall use a light scattering type photo electric smoke sensor to sense changes in air samples from its surroundings. An integral microprocessor shall dynamically examine values from the sensor and initiate an alarm based on the analysis of data. The detector shall utilize digital filters to remove signal patterns that are not typical of fires. Each detector shall have twin red/green status LEDs. The red LED shall indicate alarm condition and green LED shall indicate normal.
- 2 The detector shall continually monitor any changes in sensitivity due to the environmental affects of dirt, smoke, temperature and humidity. The information shall be stored in the integral processor and transferred to the loop controller.
- 3 Detector shall be programmable for different sensitivity during day and night periods.
- 4 The detector shall be suitable for direct insertion into air ducts up to 3 ft. high and 3 ft. wide with air velocities up to 5,000 ft/min.
- 5 The detector shall be rated for ceiling installation at a minimum of 30 foot centers.
- 6 The percent smoke obscuration per foot alarm setpoint for the detector shall be field selectable to various sensitive settings ranging from 1.0% to 3.5%.

**C. Detector Mounting Bases**

- 1 Detector mounting bases shall be suitable for mounting on a standard 4" square electrical outlet box. The base shall contain no electronics, support all detector types and have the following minimum requirements:
  - 1 Removal of the respective detector shall not affect communications with other detectors.

- 2 Terminal connections shall be made on the room side of the base. Bases which must be removed to gain access to the terminals shall not be acceptable.
- 3 Capable of supporting a remote LED indicator and test station. Provide remote LED indicators and test stations as indicated on the Drawings.

**D. Detector Mounting Plates**

- 1 Provide detector mounting plate assemblies to facilitate mounting detectors for direct insertion into low velocity ductwork. The mounting plate shall be code gauge steel with corrosion resistant red enamel finish.

**E. Duct Smoke Detectors**

- 1 Air duct mounted smoke detectors shall be provided in the air supply stream of all central air handling equipment above 2000 cfm, i.e. Provide all necessary interface wiring for proper system operation.
- 2 The duct smoke detector shall be UL listed per UL 268A specifically for use in air handling systems. The detector shall operate at velocities of 300-4000 ft./min. The detector housing shall be equipped with an integral mounting base. It shall be capable of local testing via magnetic switch or remote testing using a remote test station. The duct detector housing shall incorporate an airtight smoke chamber in compliance with UL 268A. The housing shall be capable of mounting to either rectangular or round ducts without adaptor brackets. An integral filter system shall be included to reduce dust and residue effects on detector housing, thereby reducing maintenance and servicing. Sampling tubes shall be easily installed after the housing is mounted to the duct by passing through the duct housing. The housing shall have a red enamel finish.
- 3 For each duct smoke detector provide a remote LED indicator and test station to be mounted in a location indicated on the Drawings and approved by the local authority having jurisdiction.

**F. Beam Type Smoke Detectors**

1. Provide projected beam type smoke detectors. Then beam detectors shall be four wire 24 Vdc and powered from the control panel 4 wire smoke power source. This unit shall consist of a separate transmitter and receiver capable of being powered separately or together. This unit shall operate in either a short range of 30 to 100 ft. (9.14 to 30.4m) or a long range of 100 to 300 ft. (30.4 to 91.4m). The detector shall feature a bank of four alignment LEDs on both the receiver and transmitter that are used to ensure proper alignment without the use of special tools. The beam detector shall feature automatic gain control which will compensate for gradual signal deterioration from dirt accumulation on lenses. Ceiling or mount as shown on the plans. Testing shall be carried out using calibrated test filters. Provide an activated remote test station>.

**2.4 SYSTEM MODULES**

- A.** Addressable intelligent modules shall support supervised Class B circuits. The modules shall be multi-function capable of field programming. The modules shall have a minimum of 2 diagnostic LEDs mounted behind a finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing diagnostic codes which can be retrieved for troubleshooting assistance. Input and output circuit wiring shall be supervised for open and ground faults. The module shall be suitable for operation in the following environment:

- 1 Temperature: 32°F to 120°F (0°C to 49°C)
- 2 Humidity: 0-93% RH, non-condensing

**B. Single Input Module**

- 1 Addressable intelligent single input modules shall be provided as required for the system configuration. The single input module shall provide one (1) supervised Class B input circuit. The module shall be suitable for mounting on 4" square electrical box. The single input module shall support the following input circuit types:

- 1 Normally-Open Alarm Latching (Manual Stations, Smoke Detectors, etc.)
  - 2 Normally-Open Alarm Delayed Latching (Waterflow Switches)
  - 3 Normally-Open Active Non-Latching (Monitors, Fans, Dampers, Doors, etc.)
  - 4 Normally-Open Active Latching (Supervisory, Tamper Switches)
- C. Dual Input Module
- 1 Addressable intelligent dual input modules shall be provided as required for the system configuration. The dual input module shall provide two (2) supervised Class B input circuits. The module shall be suitable for mounting on a standard 4" square electrical box. The dual input module shall support the following input circuit types:
    - 1 Normally-Open Alarm Latching (Manual Stations, Smoke Detectors, etc.)
    - 2 Normally-Open Alarm Delayed Latching (Waterflow Switches)
    - 3 Normally-Open Active Non-Latching (Monitors, Fans, Dampers, Doors, etc.)
    - 4 Normally-Open Active Latching (Supervisory, Tamper Switches)
- D. Monitor Module
- 1 Addressable intelligent monitor modules shall be provided as required for the system configuration. The monitor module shall support one (1) supervised Class B normally-open active non-latching monitor circuit. The monitor module shall be suitable for mounting on a standard 4" square electrical box.
- E. Waterflow/Tamper Module
- 1 Addressable intelligent waterflow/tamper modules shall be provided as required for the system configuration. The waterflow/tamper module shall support two (2) supervised Class B input circuits. Channel A shall support a normally-open alarm delayed latching waterflow switch circuit. Channel B shall support a normally-open active latching tamper switch. The waterflow/tamper module shall be suitable for mounting on a standard 4" square electrical box.
- F. Single Input Signal Module
- 1 Addressable intelligent single input signal modules shall be provided as required for the system configuration. The single input signal module shall provide one (1) supervised Class B output circuit capable of supporting the operation of an audible/ visual signal power selector and a telephone power selector with ring tone for fire fighter's telephone. The module shall be suitable for mounting on a standard 4" square electrical box.
- G. Dual Input Signal Module
- 1 Addressable intelligent dual input signal modules shall be provided as required for the system configuration. The dual input signal module shall provide a means to selectively connect one of two (2) signaling circuits to one (1) supervised output circuit. The dual input signal modules shall be capable of supporting the operation of an audible/visual signal power selector. The module shall be suitable for mounting on a standard 4" square electrical box.
- H. Control Relay Module
- 1 Addressable intelligent control relay modules shall be provided as required for the system configuration. The control relay module shall provide one form "C" dry relay contact rated at 2 amps @ 24 Vdc to control external appliances or equipment shutdown. The control relay shall be rated for pilot duty and releasing systems. The position of the relay contact shall be confirmed by the system firmware. The control relay module shall be suitable for mounting on a standard 4" square electrical box.
- I. Universal Class A/B Module
- 1 Addressable intelligent class A/B modules shall be provided as required for the system configuration. The universal class A/B module shall be capable of numerous operations. The module shall be suitable for mounting on a standard 4" square electrical box. The universal class A/B module shall support the following circuit types:
    - 1 Two (2) supervised Class B Normally-Open Alarm Latching.
    - 2 Two (2) supervised Class B Normally-Open Alarm Delayed Latching.
    - 3 Two (2) supervised Class B Normally-Open Active Non-Latching.

- 4 Two (2) supervised Class B Normally-Open Active Latching.
- 5 One (1) form "C" dry relay contact rated at 2 amps @ 24 Vdc.
- 6 One (1) supervised Class A Normally-Open Alarm Latching.
- 7 One (1) supervised Class A Normally-Open Alarm Delayed Latching.
- 8 One (1) supervised Class A Normally-Open Active Non-Latching.
- 9 One (1) supervised Class A Normally-Open Active Latching.
- 10 One (1) supervised Class A 2-wire Smoke Alarm Non-Verified.
- 11 One (1) supervised Class B 2-wire Smoke Alarm Non-Verified.
- 12 One (1) supervised Class A 2-wire Smoke Alarm Verified
- 13 One (1) supervised Class B 2-wire Smoke Alarm Verified
- 14 One (1) supervised Class A Signal Circuit, 24Vdc @ 2A.
- 15 One (1) supervised Class B Signal Circuit, 24Vdc @ 2A.

## 2.5 MANUAL PULL STATIONS

- A. Addressable intelligent dual action, non-break glass type, key reset, semi-flush mounted manual pull stations shall be provided as indicated on the Drawings. The stations shall be of Lexan construction, finished in red with white molded raised letters "PULL IN CASE OF FIRE". The station shall be suitable for mounting on a standard 4" square electrical box. The station shall have a minimum of 2 diagnostic LEDs mounted on their integral, factory assembled single or two stage input module. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The station shall be capable of storing diagnostic codes which can be retrieved for troubleshooting assistance. Input circuit wiring shall be supervised for open and ground faults. The fire alarm pull station shall be suitable for operation in the following environment:

- 1 Temperature: 32°F to 120°F (0°C to 49°C)
- 2 Humidity: 0-93% RH, non-condensing

## 2.6 NOTIFICATION APPLIANCES

- A. General
  - 1 All appliances shall be UL listed for Fire Protective Service. All audible appliances, visual appliances and combination audible/visual appliances shall be capable of providing the equivalent facilitation which is allowed under the Americans with Disabilities Act Accesabilities Guidelines (ADA/AG), and shall be UL 1971, and ULC S526 listed.
- B. Audible Only Notification Appliances
  - 1 Audible appliances shall be a mylar cone type speaker. Paper type cones are not acceptable. The rear of the speaker shall be completely sealed protecting the cone during and after installation. Speakers shall provide power taps at 1/4w, 1/2w, 1w, and 2w. Speakers shall provide UL confirmed 90 dBA sound output at 2w.
  - 2 Audible appliances shall be provided with in/out wiring terminals.
  - 3 Audible appliances shall be flush for ceiling mounted and flush/semi-flush for wall mounted as indicated on the Drawings. They shall have a white faceplate for ceiling mounting and red faceplate for wall mounting. They shall mount to a standard 4" square electrical box.
- C. Visual Only Notification Appliances
  - 1 Visual appliances shall be a self-synchronized strobe. The strobe flashtube shall be enclosed in a rugged lexan lens with solid state circuitry. The strobe shall provide 15, 15/75, 30, 60 and 110 candela synchronized flash outputs. The strobe intensity selection shall be based on the installed location within the building.
  - 2 Visual appliances shall be provided with in/out field wiring terminals.
  - 3 Visual appliances shall have lens markings oriented for wall mounting where indicated on the Drawings. They shall have a red faceplate for flush/semi-flush wall mounting. They shall mount to a standard 4" square electrical outlet box.
- D. Combination Audible/Visual Notification Appliances
  - 1 Combination appliances shall be a combination of the audible and visual appliances specified previously. They shall have a red faceplate for flush/semi-flush wall mounting.

2 The majority, if not all, of the notification appliances shall be combination devices such that the visual and audible requirements of ADA shall be complied with. Visual notification appliances shall be located in all areas of common use, i.e. lobbies, hallways, restrooms, meeting/conference/assembly areas, break rooms, copy/fax/mail rooms, etc. Audible notification appliances shall produce a sound that exceeds the prevailing equivalent sound level in the room or space by at least 15dbA or exceeds any maximum sound level with a duration of 60 seconds by 5dbA, whichever is louder. Sound levels for alarm signals shall not exceed 120 dbA. It is the intent of the Drawings to show all devices that are required. The fire alarm system vendor/bidder shall provide all appliances shown and/or required by these specifications but it others are anticipated to be required the vendor/bidder shall qualify the provisions for the system making note of the additional cost for the anticipated additional requirements.

## **2.7 ANCILLARY DEVICES**

### **A. Remote Relays**

#### **1 Multi-Voltage Control Relays**

1 Remote control relays shall be provided as required for the system configuration for connection to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be SPDT or DPDT, as required, and rated for 10 amperes at 115 Vac. A single relay may be energized from a voltage source of 12 Vdc, 12 Vac, 24 Vdc, 24 Vac, 115 Vac, or 230 Vac, as required. A red LED shall indicate the relay is energized. A metal enclosure shall be provided.

#### **2 Manual Override Control Relays**

1 Remote control relays with a manual override shall be provided as required for the system configuration for connection to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be SPDT and rated for 10 amperes at 115 Vac or 24 Vdc. A single relay may be energized from a voltage source of 24 Vdc or 24 Vac. A red LED shall indicate the relay is energized.

#### **3 Heavy Duty Power Relays**

1 Remote control relays shall be provided as required for the system configuration for connection to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be DPDT and rated for 30 amperes at 300 Vac or 2 HP motor load. A single relay may be energized from a voltage source of 24 Vac, 115 Vac, as required. A metal enclosure shall be provided.

## **2.8 ELECTROMAGNETIC DOOR HOLDERS**

A. Provide single or double door, floor or wall mounted electromagnetic door holder/release devices as indicated on the Drawings. The devices shall be rated for 24V ac/dc input. The devices shall be brushed zinc finished.

## **2.9 FIRE ALARM CABLE**

A. The fire alarm cable shall plenum rated and be UL listed and suitable for use as power limited fire protective signaling circuit cable in accordance with National Electric Code Article 760 (Fire Alarm Systems) and Article 725 (Class 1, Class 2 and Class 3 - Remote Control, Signaling and Power-Limited Circuits).

### **B. Cable Construction**

1 Conductors shall be solid, soft annealed, uncoated copper.

2 Insulation shall be 300 volt, 105°C polyvinylchloride.

3 Two conductor, non-shielded cables shall be parallel; shielded and three or more conductors shall be cabled round.

4 Shielding shall be mylar backed aluminum foil, helically wrapped to provide 100% coverage. A suitable copper drain wire shall be provided with shielded cables.

5 Jacket shall be red, 105°C polyvinylchloride, rated 300 volt.

6 Cable shall be plenum rated when installed in air handling plenums.

C. In general, non-shielded cable is acceptable for use throughout except on voice circuits. All voice circuits shall utilize shielded, twisted pair cable.

## **PART 3 - EXECUTION**

### **3.1 APPROVALS**

- A. Complete fire alarm system drawings shall be issued to the Local Authority Having Jurisdiction for approval prior to the installation of the fire alarm system.

### **3.2 INSTALLATION**

- A. Installation of the Fire Alarm System shall be in strict compliance with manufacturers recommendations. The entire system shall be installed in accordance with approved manufacturers manuals and wiring diagrams and as approved by the Local Authority Having Jurisdiction.
- B. Fire alarm cable shall be installed in conduit in areas of exposed structure and within inaccessible ceilings. Conduit shall also be provided from outlet boxes within walls stubbed up to accessible ceilings. Provide **end bushings** on conduit stub-ups. Cable only is acceptable in accessible ceilings.
- C. All conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation shall be included as part of the system. All junction box blank coverplates shall be labeled with a red "F.A." for identification purposes.
- D. All wiring shall be color coded throughout.
- E. The system shall be installed and fully tested under the supervision of trained manufacturer's representatives. The system shall be demonstrated to perform all the functions as specified.

**END OF SECTION**

**SECTION 16741  
TELEPHONE AND DATA COMMUNICATION**

**PART 1 - GENERAL**

**1.1 RELATED REQUIREMENTS**

- A. The General Provisions, Supplemental General Provisions, Special Provisions and Division 1 Specification sections, apply to work covered by this Section.
- B. Comply with Division 16 Sections, as applicable. Refer to other Divisions for coordination of work.

**1.2 SCOPE OF WORK**

- A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of a telephone and data communications empty conduit system, including all related systems and accessories.
- B. Refer to section 17120 and 16740 for wiring.

**1.3 SUBMITTALS**

- A. Submit product data and shop drawings in accordance with Division 1 for products specified under PART 2 - PRODUCTS.

**PART 2 - PRODUCTS**

**2.1 GENERAL**

- A. Conduit, conduit sleeves, outlet boxes, cover plates and pullwire as indicated.
- B. Fireproofing material for telephone and data communication conduit and conduit sleeves through fire rated walls and floors.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Install telephone and data communication raceways as indicated.
- B. Install individual raceways from telephone and data communications outlets to above accessible ceiling. In areas without a ceiling, raceways shall be routed to the nearest ceiling space. In building without a ceiling, raceways shall be extended back to the main telephone/ data communication board or to a location indicated on the Drawings.
  - 1 Minimum size conduit: **one inch**.
  - 2 Raceway installation shall be in accordance with Section 16130.
  - 3 Coordinate raceway installations in millwork and other fabricated architectural items with the other portions of the Work.
  - 4 Provide pullwire in each raceway tagged on each end.
  - 5 Raceways shall be terminated with an **insulating bushing** or a suitable connector with an insulated throat.
- C. Provide telephone and data communications outlet boxes.
  - 1 Provide a one-gang outlet unless noted otherwise.
  - 2 Install outlet box and device ring at each location.
  - 3 Install telephone and data communications outlets at same height specified for convenience outlets unless noted otherwise. Group telephone and data communications outlets with related receptacle outlets unless noted otherwise.
  - 4 Install a blank cover plate on all unused communications outlet boxes.

**END OF SECTION**

**SECTION 16900  
EQUIPMENT CONNECTIONS AND CONTROL WIRING**

**PART 1 - GENERAL**

**1.1 RELATED REQUIREMENTS**

- A. The General Provisions, Supplemental General Provisions, Special Provisions and Division 1 Specification sections, apply to work covered by this Section.
- B. Comply with Division 16 Sections, as applicable. Refer to other Divisions for coordination of work.
- C. The furnishing and installation of control power wiring required for equipment furnished under Division 15 and not shown on the electrical drawings shall be furnished under Division 15. Control power wiring is defined as the line voltage (120V) power wiring for equipment control cabinets, temperature control, energy management, or building automation system panels and line voltage smoke/fire dampers. Provide 120V to equipment control devices. Coordinate with Division 15 prior to rough-ins.
- D. The furnishing and installation of the temperature control wiring, energy management system or building automation wiring not shown on the electrical drawings shall be furnished under Division 15. Temperature control, energy management system and building automation system wiring is defined as the interlock or interconnecting wiring required between system control devices, appurtenances and control panels to allow the system to function automatically. This includes wiring between the fire alarm system, smoke exhaust systems, door entry systems and any other system requiring interface with the temperature control, energy management and building automation system.

**1.2 SCOPE OF WORK**

- A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of power wiring to each motor-driven and/or electrically-operated system or unit of equipment.
- B. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of the line voltage wiring serving power to a motor(s) or piece of electric powered equipment. The wiring shall allow the motor(s) or equipment to operate in a manual mode.
- C. All control wiring above the ceiling or in the A/C return plenum shall be plenum rated cable.
- D. Provide labor, materials, equipment, tools and services and perform operations required for, and reasonably incidental to, the providing of control wiring for miscellaneous systems. The Contractor shall be responsible for reviewing the project specifications to ascertain the extent of the control wiring required for the miscellaneous systems and shall assume the responsibility for performing the work.
- E. Provide labor, materials, equipment, tools and services, and perform operations required for and reasonably incidental to, the providing of a fully connected and operating smoke damper installation. Coordinate with the mechanical contractor th required work. The following is a description of the responsibilities for the specified system:
  - 1 The mechanical contractor will provide the smoke dampers and actuators as indicated in the specifications and on the plans. In addition, if the smoke dampers have pneumatic actuators, the mechanical contractor will provide all control air piping from a source to each smoke damper and the electro-pneumatic (EP) and/or pneumatic-electric (PE) switches as required for actuation of the smoke dampers.
  - 2 The electrical contractor shall provide the power wiring for the smoke damper actuators.
  - 3 The fire alarm contractor shall provide the signal and control wiring for the operation of the smoke dampers including all wiring of EP and/or PE switches.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Materials and equipment provided hereinafter shall comply with other Division 16 Sections and with Division 15 of these Specifications.

## **PART 3 - EXECUTION**

### **3.1 MOTORS**

- A. Except for items that are furnished with factory-installed, integral motors, an electric motor of required size and electrical characteristics will be provided and installed as specified in Division 15 for each item of motor-driven equipment. As part of the work of this Section, complete the electrical installation of these motors in accordance with approved wiring diagrams and instructions.
- B. Where disconnect switches or circuit breakers are not provided integral with control equipment for motors and other electrical appurtenances, provide and install all disconnect switches required by the National Electrical Code and/or as indicated on the Drawings.

### **3.2 SYSTEM, EQUIPMENT AND DEVICE WIRING**

- A. Connect complete for operation all items of heating, ventilation, air conditioning, plumbing, fire protection and all electrical systems, equipment and devices furnished by the Owner or specified in other Divisions of the Specifications. System, equipment and device outlets of various types have been indicated in the Specifications or on the drawings, but indication of exact location or scope of the work may not be indicated. Refer to the Owner and to the work specified in the other Divisions for the scope of connections to the equipment furnished by them and for the exact locations of all connections to the equipment furnished by them. Power wiring shall be provided under Division 16 as indicated. Control wiring not indicated to be provided under Division 16 shall be provided by the provider of the system, equipment, or device and installed and terminated under Division 16. Request all rough-in drawings required for proper installation of the electrical work in ample time to permit preparation of the installation drawings and thus avoid delays on the job.

**END OF SECTION**