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SET#

# SEDGWICK COUNTY

## ADULT DETENTION FACILITY

## WATER HEATER REPLACEMENTS

BID DOCUMENTS

SPECIFICATIONS

24 December 2025

SCHAEFER PROJECT : 5278.53

257 N Broadway Wichita, KS 67202 316.684.0171 schaefer-arch.com

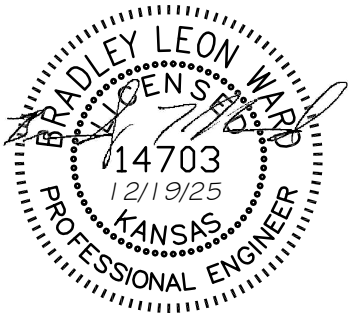
# SECTION 00 01 07 - SEALS PAGE

**SCHAEFER ARCHITECTURE**

**ARCHITECTS**


**MIDWEST ENGINEERING, INC.**

**MECHANICAL ENGINEER**




**INTEGRATED CONSULTING ENGINEERS, INC.**

**ELECTRICAL ENGINEERS**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### Division 02 -- Existing Conditions



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### Division 22 -- Plumbing

**END OF SECTION**

# SEDGWICK COUNTY ADULT DETENTION FACILITY
# DOMESTIC WATER HEATER REPLACEMENT

**INVITATION FOR BIDS**

PROJECT: Sedgwick County Adult Detention Facility
Domestic Water Heater Replacement
141 W. Elm Street
Wichita, KS 67203

COUNTY BID NUMBER **26-0003**

**PRE-BID MEETING:**
A pre-bid meeting will be held on site. Bidders are to meet at 141 W. Elm, Wichita, KS beginning at 9:00 a.m. CDT on **Tuesday, January 13, 2026**. Meeting will start at the Adult Detention Facility Lobby.

Attendance is not mandatory; however, this will be the only time to meet directly with County staff and the architect to answer questions concerning this project. General contractors are encouraged to have their subcontractors attend this meeting to view the site conditions.

Bidders are encouraged to examine bidding documents as early as possible. **In order to ensure each bidder has the most current information for bidding there is an established date and time for last questions to be asked. Bidders requiring clarification or interpretation of the Bidding Documents shall make such requests, in writing only, to Ms. Lee Barrier, Purchasing Agent, at Lee.Barrier@sedgwick.gov no later than 5:00 p.m. CDT on Wednesday, January 21, 2026.**

**RESPONSES TO INVITATION FOR BID:**
**PLEASE NOTE ADDRESS CHANGE FOR PURCHASING DEPARTMENT.**
Responses will be received by the Sedgwick County Purchasing Department, located at **100 N. Broadway , Suite 610 Finance Conference Room**, Wichita, Kansas 67202, until **1:45 p.m. CDT** on **Tuesday, February 3, 2026**. Late Bids will not be accepted and will not be considered for award recommendation.

Purchasing is now offering the option of electronic bid submission.
Should you elect to participate, please email the entire document with supplementary materials to:

Purchasing@sedgwick.gov

Again, submittals are due **NO LATER THAN 1:45 pm on Tuesday February 3, 2026**. If there is any difficulty submitting a response electronically, please contact the Purchasing Technicians at Purchasing@sedgwick.gov for assistance. Late or incomplete responses will not be accepted and will not receive consideration for final award.

If you choose to send a hard copy of your bid, Sedgwick County will not accept submissions that arrive late due to the fault of the U.S. Postal Service, United Parcel Service, DHL, FedEx, or any other delivery/courier service.

**BID RESPONSES WILL BE OPENED AT: 2:15 p.m.** on **Tuesday, February 3, 2026.**
This meeting will be held in the Finance Department, 100 N. Broadway, Suite 610, Wichita, Kansas, 67202. All interested parties are invited to attend this meeting, as bids/responses will be received, publicly opened and read aloud or you may listen in as the bids/responses are read into the record. If you would like to listen in, please dial our Meet Me line @ (316) 660-7271 at 2:00 pm.

After review and appropriate approval, a contract will be awarded to the lowest responsive, responsible and best bidder meeting specifications and appropriately licensed to do the specified work outlined in these documents.

# SEDGWICK COUNTY ADULT DETENTION FACILITY
# DOMESTIC WATER HEATER REPLACEMENT

**Plans and specifications are available in electronic form only and may be downloaded by clicking the following link, Sedgwick County Construction Projects. Company information will be collected to generate a plan holder's list which will be updated weekly and available at the Sedgwick County Courthouse Upper Floors Remodel section of the current RFP/RFQ page.** Plans are available for **viewing only** in the County Clerk's office, 100 N. Broadway, Wichita, Kansas 67202.

There will be **NO** Bid Document Deposit for this set of Documents.

This project will require **Davis- Bacon** wage rates as well as "**Buy American-Build American**" standards.

**A RECOMMENDATION FOR CONTRACT AWARD**:
will be made to the Board of Bids and Contracts at its regular meeting **at 10:00 a.m. CDT on Thursday, February 5, 2026,** generally held in the County Commission Meeting Room located at **100 N. Broadway**, Wichita, Kansas, 67202, although this date or location could change.

**CONTRACT AWARD:**
Board of County Commissioners will consider award on **Wednesday, February 11, 2026, although this date could change.**

**PROJECT SCOPE:**
This project will replace all six domestic water heaters serving the Adult Detention Facility (ADF). These units vary in dates of installation with one and two installed in 2009, three installed in 2005, four and five installed in 1997, and six installed in 2012.

**BIDDING DOCUMENTS**:
1. Complete sets of Bidding Documents shall be used in preparing Bids.
2. Neither the Owner nor the Architect/Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
3. The Owner or Architect/Engineer, in making copies of the Bidding Documents available, do so only for the purpose of obtaining Bids on the work and do not confer a license or grant for any other use.
4. Bids shall include furnishing all labor, materials, equipment and performing the work for the above-described Project in strict accordance with the Bidding Documents and any Addenda.

**DURING BIDDING PERIOD:**
Inquiries regarding Bid Documents, Bid/Selection process or any requests for information about this specific project shall be directed in writing only to:

Ms. Lee Barrier, Purchasing Agent
100 N. Broadway, Suite 610
Wichita, Kansas 67202
Telephone: (316) 660-7150 Fax: (316) 660-1839
E-mail: Lee.Barrier**@sedgwick.gov**

**All contact concerning this solicitation shall be made through the Purchasing Department.**
Bidders shall not contact county employees, department heads, using agencies, evaluation committee members or elected officials with questions or any other concerns about the solicitation. Questions, clarifications and concerns shall be submitted to the Purchasing Department **in writing**. Failure to comply with these guidelines may disqualify the Bidder's response.

# SEDGWICK COUNTY ADULT DETENTION FACILITY
# DOMESTIC WATER HEATER REPLACEMENT

**OWNER'S REPRESENTATION:**

Owner's Representative for the duration of the Project:

Paul Cavanaugh, Project Services Manager
271 W. 3rd Street, Suite 323
Wichita, Kansas 67202
Telephone: (316) 660-9080 Fax: (316) 383-7509
E-mail: paul.cavanaugh@sedgwick.gov

Architect's Representative:

Justin Graham, AIA Associate Architect
Schaefer Architecture
257 N. Broadway
Wichita, Kansas 67202-2303
Telephone: (316) 684-0171
E-mail: jgraham@schaefer-arch.com

**BIDDER'S REPRESENTATION:**

In order to induce the Owner to accept their Bid, in addition to and not in lieu of any other representations and warranties contained in the Bidding Documents, the Bidder represents and warrants the following to the Owner:

1. The Bidder and their subcontractors are financially solvent and possess sufficient working capital to complete the work, and perform all obligations hereunder.
2. The Bidder is able to provide the plant, tools, materials, supplies, equipment, and labor required to complete the work and perform the Bidder's obligations hereunder.
3. The Bidder will be authorized to do business in the State of Kansas, and will be properly licensed to do this work.
4. The Bid and execution of the Bidding Documents and the Bidder's performance thereunder are within the Bidder's duly authorized powers.
5. The Bidder has made an exhaustive study of the Bidding Documents; understands the terms and provisions thereof; and has sought or will timely seek any and all necessary clarifications prior to submitting the Bid; and that the Bid is made in accordance with the foregoing.
6. The Bidder has visited the Project and is completely familiar with the local and special conditions under which the work is to be performed and has correlated such knowledge with the requirements of the Bidding Documents.
7. The Bid is based upon the approved materials, systems and equipment described in the Bidding Documents without exception, including all warranties, coordination and components required to perform the work.
8. The Bidder certifies that their Bid is submitted without collusion, fraud, or misrepresentation as to other Bidders, so that all Bids for the Project result from a free, open and competitive bidding environment.
9. The Bidder possesses a high level of experience and expertise in the business administration, management, and superintendence of projects of the size, complexity and nature of this particular Project, and that the Bidder will work with the care, skill and diligence of such a contractor.
10. The Bidder acknowledges that the Owner is relying upon this Bidder's skill and experience in connection with the work being bid herein.
11. That complete sets of Bidding Documents were used in the preparation of the Bid and that neither the Owner nor the Architect is responsible for errors or misinterpretations resulting from the use of incomplete sets of such Documents.

The foregoing warranties are in addition to, and not in lieu of (A) any and all other liability imposed upon the Contractor by law with respect to the Contractor's duties, obligations and performance of the work and (B) any and all other warranties, representations and certifications made in the Bidding Documents. The Contractor's liability hereunder shall survive the Owner's final acceptance of and payment for the work. All representations and warranties set forth herein and in the Contract Documents shall survive the final completion of the work or the earlier termination of this Agreement.

Bid Guarantee:

1. Bid Security is required in the amount of at least 5% of the bid plus all additional alternates. In case of multiple prices in a bid or alternate, write for the maximum possible contract amount.
2. Bid Security can be in the form of a certified or Cashier's Check or Bid Bond acceptable to Sedgwick County. Checks are to be made payable to the Sedgwick County Clerk and drawn on a solvent Kansas bank or trust company. These checks or bonds will be retained by Sedgwick County until the purchase contract has been awarded.
3. Bid Bonds shall be written by a bonding agency approved by the United States Treasury Department and licensed to do business in the State of Kansas.
4. Bid Bonds shall be submitted on AIA Document A310, latest edition, as issued and approved by the American Institute of Architects.
5. Bid Security will be retained by the Sedgwick County Clerk until the Contract for the Project has been completed and is a guarantee that if awarded the Contract, the Bidder will enter into a contract and give bonds as required. In the event the successful Bidder fails to consummate a signed Contract, through no fault of the Owner, Bid Security shall be retained by the Owner as liquidated damages and not as a penalty.
6. Sedgwick County reserves the right to retain the Bid Security of the three (3) lowest Bidders until the successful Bidder has entered into a Contract or until 60 days after Bid opening, whichever is the shorter. All other Bid Securities will be returned as soon as practicable.

Sedgwick County is desirous of allowing as many Kansas vendors as possible the opportunity to participate, including minority owned, woman owned and small businesses, in the roles of general contractors and subcontractors. If your company does not fall into either of these categories, your efforts to contract with vendors who fall in these categories are appreciated.

General Contractor will be required to maintain a subcontractor worksheet throughout the project and will submit the worksheet to County staff at anytime requested but shall submit the worksheet at the completion of project.

**END OF INVITATION FOR BIDS**

# SEDGWICK COUNTY ADULT DETENTION FACILITY
# DOMESTIC WATER HEATER REPLACEMENT

**INSTRUCTIONS TO BIDDERS**

PROJECT: Sedgwick County Adult Detention Facility
Domestic Water Heater Replacement
141 W. Elm
Wichita, KS, 67203

COUNTY BID NUMBER: **26-0003**

ARCHITECT: Justin Graham AIA, Associate Architect
Schaefer Architecture
257 N. Broadway
Wichita, Kansas 67202-2303
Telephone: (316) 684-0171
E-mail: jgraham@schaefer-arch.com

Bids shall be made in accordance with these Instructions to Bidders:

A. Responses to this invitation will be accepted only from General Contractors who are licensed to do business in Sedgwick County.

B. Applications will also be accepted from General Contractors who have applied to receive a reciprocal license.

C. A copy of General Contractor's Certificate of Insurance will be required to be submitted with the Bid at the time the bids are due. Insurance policy will be due from the successful contractor as part of the required documents prior to issuance of the notice to proceed.

D. Bidding Documents shall include the Invitation for Bids, Bid Form, construction drawings, proposed Contract Documents, including any Addenda issued prior to receipt of Bids, supplemental information and any additional information requested.

E. Bids must be on a lump sum basis and shall be the Contract Amount.

F. Bidder Qualifications: For the duration of the project, all Prime Bidders shall be located within Sedgwick County, Kansas or establish an office in Sedgwick County, Kansas, and may be required by the Owner to furnish information to support the Bidder's capability to fulfill the Contract if awarded the Contract. Such information does not need to be submitted with the Bid, but may be requested at the Owner's option. Such information may include, but not be limited to, the following:

1. Proof of registration with the Kansas Director of Taxation by non-resident Bidders (K.S.A. 79-1009).
2. Proof of registration with the Kansas Secretary of State by foreign corporations.
3. List of projects of similar size and type the Bidder has constructed or in which the Bidder has been engaged in a responsible capacity.
4. Evidence the Bidder maintains a permanent place of business.
5. A current financial statement.

**Examination:**

1. BEFORE SUBMITTING A BID, each Bidder shall examine carefully all documents pertaining to the work and visit the site to fully inform himself of the condition of the site and the conditions and limitations under which the work is to be performed.

2. SUBMISSION OF A BID will be considered presumptive evidence that the Bidder has fully informed himself of the conditions of the site, requirements of the Contract Documents, and of pertinent national, state and local codes and ordinances, and that the Bid made allowances for all conditions, requirements and contingencies.

3. In reviewing these Documents, it is evident that certain information, if disclosed to the public, may jeopardize the security of Sedgwick County, and appropriate measures will be taken to maintain confidentiality.

4. **In order to ensure each bidder has the most current information for bidding there is an established date and time for last questions to be asked. Bidders requiring clarification or interpretation of the Bidding Documents shall make such requests, in writing only, to the Purchasing Agent no later than 5:00 p.m. CDT on Wednesday, January 21, 2026.**

5. Samples shall be submitted by the above referenced deadline to permit evaluation and notification of Bidders.

6. Any interpretation, correction or change of the Bidding Documents will be made by written Addenda. Interpretations, corrections, or changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon such interpretations, corrections, and changes.

**Addenda:**

1. DISCREPANCIES OR OMISSIONS in the documents will be clarified in the form of an electronic Addendum and will be posted on the County web site. Bidders finding discrepancies, omissions, or who are in doubt as to the meaning of any portion of the Contract Documents, should immediately request an interpretation from the Senior Purchasing Agent. In response, an Addendum will be issued and the contractor shall rely solely on information contained in the written Addenda about said discrepancy or omission. **Neither the Architect nor the Owner will be responsible for any other form of instructions or interpretations given to the contractor, either verbal or written.**

2. ADDENDA received by Bidders shall be acknowledged by same on their Bid Form.

**Substitutions:**

1. Each Bidder represents that their Bid is based upon materials and equipment described in the Bidding Documents.

2. No substitution will be considered unless written request has been submitted to the Purchasing Agent and the Architect, in duplicate, for approval by **5:00 p.m. CDT on Wednesday, January 21, 2026**. Each such request shall include a complete description of the proposed substitute, drawings, cuts, performance or test data, or information necessary for a complete evaluation. If the Architect approves any proposed substitution, such approval will be set forth in an Addendum.

**Preparation of Bids:**

1. BIDS shall be made on unaltered Bid Forms furnished by the County, or detached from this Project Manual.

2. FILL IN all blanks on the Bid Form with ink or type. Blanks left on Bid Form may be cause for disqualification of Bidder.

3. SIGN BID FORM in longhand, with name typed below signature. Where Bidder is a Corporation, Bids must be signed with the legal name of the Corporation, followed by the legal signature of an officer authorized to bind the Corporation to a contract.

4. RECAPITULATION of work to be done shall not be included with any Bid.

5. Where so indicated by the makeup of the Bid Form, amounts shall be expressed in both words and figures, and in case of discrepancy between the two, the written amount shall govern.

**Identification and Submission of Bid:**

1. Contractor shall provide one (1) Original of the Bid Response Form, Bid Security and other supplemental information required to be submitted with the Bid.

2. All of the Bid Documents shall be enclosed in a sealed envelope with the notation “Bid Enclosed” on the face. The firm name and address, Bid number, Bid opening date, and Bid opening time shall be provided in the lower left-hand corner of the Envelope.

**Modification and Withdrawal of Bid:**

1. A Bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period that a Bidder’s Bid Security is held following the time and date designated for the receipt of Bids. The Bidder so agrees in submitting his Bid.

2. WITHDRAWAL BEFORE BID OPENING: A Bid may be withdrawn at any time before Bid Opening, but may not be resubmitted. If a bidder withdraws a bid, as authorized in K.S.A. 75-6905, the awarding authority may require that such bidder shall not be allowed to perform any work on the project through subcontract agreements or by any other means including re-bids.

3. AFTER BID OPENING: No Bid may be withdrawn or modified, except where the award of contract has been delayed for more than 60 days.

In the event of an Award, the lowest, responsive, responsible and best bid price meeting the specifications will be required to enter into contract required for the Project. Said Bidder shall also provide a Performance Bond for the full amount of the contract. The Performance Bond, in the amount of 100% of the Contract amount, must be submitted within 30 calendar days after award of contract. Failure to return these Documents within the required time period may cause a cancellation of the Award.

**Consideration of Bids/Selection Process:**

1. Bids received will be opened and read aloud publicly.

2. Owner shall have the right to determine the acceptable Bidder on the basis of the sum of the Base Bid and the Alternates accepted.

3. The Owner will award a contract to the lowest, responsive, responsible and best Bidder provided:

    a. The Bid conforms to and has been submitted according to the requirements of the Bidding Documents and includes the Certificate of Insurance including Contractor’s General Automotive Liability, Workers Compensation Insurance and Owner’s Liability Insurance.

    b. The Bid is judged to be reasonable.

    c. The Bid does not exceed the funds available.

    d. The Bid complies with the Instruction to Bidders and Mandatory Requirements.

    e. The completion time is satisfactory to the Owner.

f. Evidence of the experience, qualifications and financial responsibility of the Bidder and his Subcontractors and the time of completion are all satisfactory to the Owner.

g. The County reserves the right to reject Bidders in accordance with the Bidding Documents.

4. Bids will be screened by a Review Committee consisting of the Project Manager, Architect and the Purchasing Agent.

5. No negotiations, decisions, or actions shall be initiated by any firm as a result of any verbal discussion with the Owner or employee of the Owner before the opening of responses to the document.

6. The Owner shall have the right to waive any informality and/or irregularity in any Bid received.

7. The Owner shall have the right to reject any and all Bids.

**Time for Completion and Liquidated Damages:**

All Bidders are required to state on the Bid Form the time needed for all work under the general contract to be completed, which would yield their best Bid. Unless otherwise required, this time frame shall be stated in calendar days and shall represent the Contractor's commitment to complete the project on schedule.

The contractual period will begin with the issuance of Notice to Proceed and continue through completion of the project.

The Agreement will include a stipulation that liquidated damages will be assessed in the amount of $500.00 per calendar day after Completion Date that the work is not substantially complete.

Upon satisfactory completion of the Contract, a formal CERTIFICATE OF PROJECT COMPLETION will be forwarded to the Contractor by the Project Architect. The date of substantial completion of the Project will be the starting date of the warranty period.

All work shall be in accordance with all Federal and State Laws, Local Ordinances and Building Codes, and the 2010 Standards for Accessible Design.

Taxes: Materials and equipment incorporated in the work are exempt from payment of sales tax under the laws of the State of Kansas.

**Project Time Line:**

The following dates are provided in addition to those previously stated to help interested contractors in planning participation in the project herein. The dates listed, however, are in no way guaranteed and are subject to change without notice.

**Project out for bid – Tuesday, January 6, 2026**
**Pre-bid Meeting – Tuesday, January 13, 2026 at 9:00 a.m. CDT**
**Last questions received-Wednesday, January 21, 2026 at 5:00 p.m. CDT**
**Last Addendum issued- Friday, January 30, 2026 at 5:00 p.m. CDT**
**Bids Due in Purchasing – Tuesday, February 3, 2026 at 1:45 p.m. CDT**
**Bid Opening – Tuesday, February 3, 2026 at 2:15 p.m. CDT**
**Board of Bids and Contracts – Thursday, February 5, 2026, at 10:00 a.m. CDT**
**Board of County Commissioners – Wednesday, February 11, 2026 at 9:00 a.m. CDT**

# SEDGWICK COUNTY ADULT DETENTION FACILITY
# DOMESTIC WATER HEATER REPLACEMENT

**Notice to Proceed:**

No work shall commence until the Owner issues a Notice To Proceed, and a Notice To Proceed will not be issued until all of the following are delivered to the Project Services Office, 271 W 3rd St., Suite 325, Wichita, Kansas, 67202, by the selected vendor:

1. The Contract signed by the representative with authority and ability to do so.
2. Performance and Statutory Bonds with the attached powers of attorney. Attach the receipt of the Clerk of the District Court to the Statutory Bond.
3. List of subcontractors and supplier's proof of a valid Contractor's license from the jurisdiction in which the work is being performed for both contractor and applicable sub-contractors is required.
4. Corporate Resolution of authority to sign and deliver the Contract Documents, executed by the Corporation's Secretary or Assistant Secretary and dated before all other dated submittals.
5. Domestic (Kansas) corporations shall furnish evidence of good standing in the form of a Certificate signed by the Kansas Secretary of State. Foreign (non-Kansas) corporations shall furnish evidence of authority to transact business in Kansas, in the form of a Certificate signed by the Kansas Secretary of State.
6. Construction Schedule with major milestones identified.
7. Insurance Certification for Payment.

Such documents must be delivered within ten (10) days of the Owner's written notification to the successful Bidder. If they are not delivered within such time then the Bidder will be deemed to have abandoned its contract with the Owner, and the Owner will award a contract to the next lowest and best Bid.

1. The successful Bidder shall not make claim either for time or money against the Owner for labor or materials performed or delivered prior to issuance of the Notice to Proceed.
2. The County's responsibility to issue a Notice To Proceed is expressly conditioned on the Contractor's timely execution and delivery of such documents.
3. The County intends to issue a Notice To Proceed within 30 days of receipt of Bids.
4. Bidders shall also note that the Work cannot begin until after a State of Kansas Sales Tax Exemption Certificate has been provided by Sedgwick County and affixed to the Purchase Order and the Notice to Proceed.
5. Contractor must submit Insurance Policy.

END OF INSTRUCTIONS TO BIDDERS

# SEDGWICK COUNTY ADULT DETENTION FACILITY
# DOMESTIC WATER HEATER REPLACEMENT

## BID FORM

**BID PROVIDED BY:**

_____
(Company Name)

I have received the Bid Documents, Specifications, and Construction Documents, collectively known as the Contract Documents for Construction of the

**Sedgwick County Adult Detention Facility**
**Domestic Water Heater Replacement**

**COUNTY BID NUMBER 26-0003**

as prepared by the Architect: Justin Graham, AIA, Associate Architect
Schaefer Architecture
257 N. Broadway
Wichita, Kansas 67202-2303
Telephone: (316) 684-0171

**In submitting this Bid, I agree:**

1. To hold my Bid open for 60 days after the date of this Bid.

2. To enter into and execute a Contract, if awarded on the basis of this Bid, and to proceed in accordance with the requirements of the General Conditions and Contract Form.

3. To provide all labor, materials, equipment, tools of trades and labor, accessories, appliances, warranties and guarantees, and to pay all royalties, fees, permits, licenses and applicable taxes necessary to complete the work in accordance with the proposed Contract Documents.

4. To remove and haul away from the construction site any and all debris arising from this contract and to assume sole liability for all removal, handling, and dumping of debris.

5. To comply with any and all local, state, federal or other governmental laws, rules and regulations with respect to the transportation, disposal, and dumping of debris and other excavated materials and Contractor shall secure any and all necessary permits and approvals incident to said transportation, dumping and disposal.

6. To further agree to indemnify and hold the Owner and Designer harmless from any and all claims and/or damage of any kind whatsoever as a result of the Contractor's performance of this Contract.

7. That attached to this Bid is one copy of the Certificate of Insurance including Contractor's General Automotive Liability, Workers Compensation Insurance and Owner's Liability Insurance.

8. **CALENDAR DAYS:**
The Undersigned agrees to reach substantial completion of the Work in _____ consecutive calendar days from the date of Notice to Proceed.

The Undersigned agrees to reach final completion of the Work in _____ consecutive calendar days from the date of Substantial Completion.

# SEDGWICK COUNTY ADULT DETENTION FACILITY
# DOMESTIC WATER HEATER REPLACEMENT

Total Calendar Days _____

9. **BID:**

BASE BID

To complete the Base Bid Work, in the time stipulated, in accordance with the Bidding Documents for the lump sum price of:

_____

_____Dollars ($_____).

ALTERNATES:

_____

_____Dollars ($_____).

10. **ADDENDA:**

The Bidder acknowledges receipt of the following numbered Addenda:

None (__) #1(___) #2(___) #3 (___) #4(___) #5(___)

11. **AGREEMENTS:**

The Undersigned agrees to the following terms and conditions:

a. An incomplete Bid, or other information not requested which is written on this Bid Form, may be cause for rejection.
b. Read the Invitation for Bids and the Instructions to Bidders carefully.
c. The Owner reserves the right to reject any or all Bids and to waive all technicalities should such action be deemed to be in the best interest of the Owner.
d. This Bid may not be withdrawn for a period of 60 calendar days following the receipt and opening.
e. Failure to acknowledge receipt of any Addendum issued may be cause for Bid rejection.
f. In the event that changes to the work are required, the undersigned agrees that ten percent (**10 %**) total between General and Subcontractors of his net costs shall be added thereto for Overhead, Profit and General Requirements (including but not limited to, Insurance and Bonds).

12. **MAJOR SUBCONTRACTORS:**

The Undersigned acknowledges the following named major subcontractors are to be used for their respective division of work. Contractors shall identify by type, any disadvantaged, minority and women-owned businesses used as a subcontractor for this project.

Subcontractor:_____

Address – City, State, Zip: _____

Additional, if necessary:

13. **DECLARATIONS:**

The Undersigned hereby declares he has carefully examined the Drawings and Specifications, has visited the actual location of the work, has satisfied himself as to all conditions and understands that, in signing this Bid Form, he waives all right to plead any misunderstandings regarding same and agrees to be bound by the provisions of said Drawings and Specifications and all statements made therein.

# SEDGWICK COUNTY ADULT DETENTION FACILITY
# DOMESTIC WATER HEATER REPLACEMENT

The Undersigned proposes to enter into Contract and to furnish and pay for the specified Bonds and other required Documents within 10 working days after notification of award of Contract.

14. **FIRM IDENTIFYING INFORMATION:**

FIRM NAME _____

CONTACT _____

SIGNATURE _____TITLE _____

PRINT NAME _____

ADDRESS _____ CITY/STATE _____ ZIP _____

PHONE _____ FAX _____ HOURS _____

COMPANY WEBSITE ADDRESS _____ E-MAIL _____

NUMBER OF LOCATIONS _____ NUMBER OF PERSONS EMPLOYED_____

TYPE OF ORGANIZATION:

Public Corporation ___ Private Corporation___ Sole Proprietorship ___ Partnership __ Small Business __

General Nature of Business _____

Manufacturer _____ Distributor _____ Retail _____ Dealer____ Service _____

___Not Minority/Caucasian (00) publicly traded companies and nonprofits are in this category

Minority Owned Business:

___African American (05), ___Asian Pacific (10), ___Subcontinent Asian (15), ___Hispanic (20),

___Native American (25), ___Other (30) - Please specify_____,

___Not Minority/Caucasian – Woman Owned (50), ___African American – Woman Owned (55),

___Asian Pacific – Woman Owned (60), ___Subcontinent Asian – Woman Owned (65), ___Hispanic – Woman Owned (70), ___Native American – Woman Owned (75), ___Other – Woman Owned (80)

Insurance registered in the State of Kansas with a minimum best rating of A-VIII: ____Yes ___ No

15. **SIGNATURE AND SEAL:**

DATED THIS _____ DAY OF _____, 2026.

_____
LEGAL NAME OF PERSON, FIRM OR CORPORATION

_____
MAILING ADDRESS OF ABOVE

_____
SIGNATURE

_____
TELEPHONE NUMBER FAX NUMBER

_____
(Affix Corporate Seal here) E-MAIL

## REQUEST FOR BID CONDITIONS

In submitting a response to this Request for Bid, vendors hereby understand the following:

1. Pricing offered in the bid document will be provided to other local governments and governments whom Sedgwick County regularly enters into cooperative agreements.

2. Sedgwick County reserves the right to reject any and/or all bids and responses to these and/or related documents, to accept any item(s) in the bids, to waive any irregularity in the bids, and further if determined to be non-responsive in any form, or if determined to be in the best interest of Sedgwick County.

3. Alternate bids (two or more bids submitted) will be considered for an award. Sedgwick County reserves the right to make the final determination of actual equivalency or suitability of such bids with respect to requirements outlined herein. The bids submitted, and any further information acquired through interviews, will become and is to be considered a part of the final completed contract. If there is any variance or conflict, the bid specifications will control.

4. Bidders MUST return the entire document via email with any supplementary materials to purchasing@sedgwick.gov, on or before the date and time specified.

5. Bids submitted may not be withdrawn for a period of 60 days immediately following the opening of this Request for Bid. Prices MUST be free of federal, state, and local taxes unless otherwise imposed by a governmental body, and applicable to the material on the bid.

6. Sedgwick County interprets the term "Lowest Responsible and Best Bidder" as requiring Sedgwick County to: (a) choose between the kinds of materials, goods, wares, or services subject to the bid, and (b) determine which bid is most suitable for its intended use or purpose. Sedgwick County can consider, among other factors, such things as the availability of service(s), part(s) material(s) and/or supply(s), warranty, maintenance, freight costs, performance of product and labor cost of items upon which bids are received.

7. All requested information must be supplied. If bidders cannot respond to any part of this request, bidders should state the reason they cannot respond and note an exception. Bidders may provide supplemental information to assist Sedgwick County in analyzing its bid.

8. If the bidder refuses or fails to make deliveries of the materials within the times specified on the face of the Request for Bid or purchase order, Sedgwick County may, by written notice, terminate the contract or purchase order.

9. The bidder will certify and warrant that goods, personal property, chattels, and equipment sold and delivered are free and clear of any and all liens, or claims of liens, for materials or services arising under, and by virtue of the provisions of K.S.A. Sections 58-201, et seq., and any other lien, right, or claim of any nature or kind whatsoever.

10. The successful bidder will hold and save Sedgwick County, and its officers, agents, servants/employees harmless from liability of any patented, or unpatented invention, process, article, or appliance manufactured, or used in the performance of the contract, including its use by Sedgwick County. Vendors working on county property or on behalf of County will be required to carry minimum insurance listed in bid document.

11. All items furnished, if applicable, must be the best of their respective kinds, and will be free from defects in material and workmanship. Items will be subject to County inspection and approval at any time within 30 days after delivery. If a substitution is made, it will be the decision of a Sedgwick County representative to determine if it is of equal quality. Items furnished must be manufactured in compliance with all existing legal or governmental directives.

12. Unless specified otherwise, all items bid are to be as a minimum but not necessarily limited to: new, current model year, and untitled prior to shipping and/or installation.

13. Sedgwick County is desirous of allowing as many Kansas vendors as possible the opportunity to participate including minority men and women-owned businesses, and small businesses in the roles of providing goods and services to Sedgwick County. If your company does not fall into any of these categories, your efforts to contract with vendors who do fall into these categories are appreciated. Construction projects utilizing subcontractors requires a subcontracting worksheet. Contact Purchasing for details.

14. Contracts entered into on the basis of submitted bids are revocable if contrary to law.

15. County reserves the right to enter into agreements subject to the provisions of the Cash Basis Law (K.S.A. 10-1112 and 10-1113), the Budget Law (K.S.A. 79-2935). Agreements shall be construed and interpreted so as to ensure that the County shall at all times stay in conformity with such laws, and as a condition of agreements the County reserves the right to unilaterally sever, modify, or terminate agreements at any time if, in the opinion of its legal counsel, the Agreement may be deemed to violate the terms of such law.

16. The Bidder agrees to comply with K.S.A. 44-1030.
    a. The contractor shall observe the provisions of the Kansas act against discrimination and shall not discriminate against any person in the performance of work under the present contract because of race, religion, color, sex, disability, national origin, or ancestry;
    b. In all solicitations or advertisements for employees, the contractor shall include the phrase, "equal opportunity employer," or a similar phrase to be approved by the commission;
    c. If the contractor fails to comply with the manner in which the contractor reports to the commission in accordance with the provisions of K.S.A. 44-1031 and amendments thereto, the contractor shall be deemed to have breached the present contract and it may be canceled, terminated or suspended, in whole or in part, by the contracting agency;
    d. If the contractor is found guilty of a violation of the Kansas act against discrimination under a decision or order of the commission which has become final, the contractor shall be deemed to have breached the present contract and it may be canceled, terminated or suspended, in whole or in part, by the contracting agency; and
    e. The contractor shall include the provisions of subsections (a) through (d) in every subcontract or purchase order so that such provisions will be binding upon such subcontractor or vendor.

17. All project participants, consultants, engineers, contractors and subcontractors, must comply with all applicable Federal, State and County laws pertaining to contracts entered into by governmental agencies. All participants must comply with the Americans with Disabilities Act (ADA), including the 2008 ADA Amendments Act, and 2010 ADA Standards for Accessible Design.

18. Contractors/subcontractors performing new construction, maintenance, alterations, or additions to Sedgwick County buildings or facilities must comply with building guidelines/codes, and the 2010 ADA Standards for Accessible Design. Any violation of the provisions of the ADA or 504, or specification deficiencies, should be reported to the county's ADA coordinator. Failure to notify the county's ADA coordinator for remedy may be considered a breach of contract and may be grounds for cancellation, termination for suspension, in whole or in any part of the contract. All construction plans will have the county's ADA coordinator approval prior to beginning any work.

19. Contractors/vendors providing services to the public on behalf of Sedgwick County will agree that all personnel in their employment that have direct contact with the public will attend ADA Awareness and Sensitivity training provided by Sedgwick County or the Independent Living Resource Center. Training should be coordinated through the county's ADA coordinator, (316) 660-7052 and evidence of training shall be provided to the county's ADA coordinator. Any violations of the provisions of ADA or section 504, will be deemed a breach of contract and be subject to termination of contract.

20. The successful bidder may have access to private or confidential data maintained by the County to the extent necessary to carry out its responsibilities of the contract. Contractor shall be responsible for compliance with the privacy provision of the Health Insurance Portability and Accountability Act (HIPAA) and shall comply with all other HIPAA provisions and regulations applicable. If the successful bidder is a business associate as that term is defined under HIPAA, the contract shall include the County's standard business associate addendum. A copy of that standard addendum is available on request.

21. The bidder responding to this bid solicitation proposes to furnish all materials, labor, supplies, equipment and incidentals necessary to provide the equipment/materials/services described herein in accordance with the Notification of Solicitation (if applicable), Request for Information (if applicable), Request for Bid, Addenda, Contract, Bonds, Insurance, Plans, Specifications, any Instructions, Mandatory Requirements and Conditions.

22. Unless specified elsewhere in the document, all prices quoted must be F.O.B. Destination, Freight Prepaid and Allowed, which will include all delivery, handling, and any other charges related to delivery including surcharges.

23. It will be understood that the bidder's sureties and insurers, as applicable, are subject to the approval of the County.

24. Prior to a vendor being awarded a contract, Domestic (Kansas) corporations shall 1) furnish evidence of good standing in the form of a Certificate signed by the Kansas Secretary of State. Foreign (non-Kansas) corporations shall furnish evidence of authority to transact business in Kansas, in the form of a Certificate signed by the Kansas Secretary of State; and 2) a copy of the Corporation Resolution evidencing the authority to sign the Contract Documents, executed by the Corporation's Secretary or Assistant Secretary.

25. Sedgwick County will not award to any vendor that is currently listed in the exclusion records of the SAM (System for Award Management) website maintained by the General Services Administration (GSA) or to any vendor presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency.

26. Sedgwick County reserves the right to conduct background checks at any time on new or existing vendors. Background checks will be used to evaluate eligibility to be engaged in a work capacity by Sedgwick County, and will not be used to discriminate on the basis of race, sex, age, color, religion, national origin, disability, genetic, sexual orientation or veteran status.

27. Upon award, the bidder agrees to execute and deliver to the County a contract in accordance with the contract documents (if applicable) within ten days of notice of the award to the bidder. The bidder agrees that the surety/deposit given concurrently herewith will become the property of the County in the event the bidder fails to execute and deliver such contract within the specified time. In the further event of such failure, the bidder will be liable for the County's actual damages that exceed the amount of the surety.

28. It will be understood that time is of the essence in the bidder's performance. The bidder agrees that the County's damages would be difficult or impossible to predict in the event of a default in the performance hereof; and it is therefore agreed that if the bidder defaults in the performance of the contract documents, the bidder will be liable for payment of the sums stipulated in the contract documents as liquidated damages, and not as a penalty.

29. The bidder hereby certifies that he or she has carefully examined all of the documents for the project, has carefully and thoroughly reviewed this Request for Bid, has inspected the location of the project (if applicable), and understands the nature and scope of the work to be done; and that this bid is based upon the terms, specifications, requirements, and conditions of the Request for Bid documents. The bidder further agrees that the performance time specified is a reasonable time, having carefully considered the nature and scope of the project as aforesaid.

30. It will be understood that any bid and any and/or all referencing information submitted in response to this Request for Bid will become the property of Sedgwick County, and will not be returned. As a governmental entity, Sedgwick County is subject to making records available for disclosure after Board of County Commission approval of the recommendation.

31. Sedgwick County will not be responsible for any expenses incurred by any vendor in the development of a response to this Request for Bid including any onsite (or otherwise) interviews and/or presentations, and/or supplemental information provided, submitted, or given to Sedgwick County and/or its representatives. Further, Sedgwick County will reserve the right to cancel the work described herein prior to issuance and acceptance of any contractual agreement/purchase order by the recommended vendor even if the Board of County Commissioners has formally accepted a recommendation.

32. By submission of a response, the bidder agrees that at the time of submittal, he or she: (1) has no interest (including financial benefit, commission, finder's fee, or any other remuneration) and will not acquire any interest, either direct or indirect, that would conflict in any manner or degree with the performance of bidder's services, or (2) benefit from an award resulting in a "Conflict of Interest". A "Conflict of Interest" will include holding or retaining membership, or employment, on a board, elected office, department, division or bureau, or committee sanctioned by and/or governed by the Sedgwick County Board of County Commissioners. Bidders will identify any interests, and the individuals involved, on separate paper with the response and will understand that the County, at the discretion of the Purchasing Director in consultation with the County Counselor, may reject their bid/quotation. The bidder certifies that this bid is submitted without collusion, fraud or misrepresentation as to other bidders, so that all bids for the project will result from free, open and competitive bidding among all vendors.

33. No gifts or gratuities of any kind shall be offered to any County employee at any time.

34. Sedgwick County will issue a purchase order/contract for the acquisition of products/services specified as a result of an award made in reference to this document. Contract documents will be subject to any regulations governed by the laws of the State of Kansas and any local resolutions specifically applicable to the purchase.

35. Any dispute arising out of the contract documents or their interpretation will be litigated only within the courts of the State of Kansas. No prepayment of any kind will be made prior to shipment. Payment will be made upon verification of delivery, compliance with specifications, assurance that the product/service performs as specified and warranted, and receipt of correct invoicing.

36. Sedgwick County will accept responses transmitted via email to purchasing@sedgwick.gov unless stated to the contrary within this document. Bids must be received prior to the time and dates listed to be considered responsive. Sedgwick County will not accept late responses and will return them to the sender. Further, Sedgwick County will NOT: (1) guarantee security of the document received; (2) be held responsible for Bids which are NOT legible (and may choose to reject such responses); and, (3) guarantee that the receiving facsimile machine will accept transmission or that phone lines are functioning and available for transmission. Submitting a bid response via email does NOT relieve the bidder of: (1) responsibilities stated in the document (such as attendance at a mandatory pre-bid conference); (2) providing non-paper informational items which must be returned with the response (diskettes, large drawings, photographs, models, etc.); and, (3) providing original copies of bid sureties (bonds, certificates of insurance, etc.).

# SEDGWICK COUNTY ADULT DETENTION FACILITY
# DOMESTIC WATER HEATER REPLACEMENT

BONDS

**PERFORMANCE AND LABOR AND MATERIAL BONDS:**

PERFORMANCE AND LABOR AND MATERIAL BONDS shall be furnished to the Owner by the Contractor, in an amount equal to 100 percent of the Contract Sum as security for the faithful performance of the contractor and payment of all persons performing labor and furnishing materials in connection with the contract. Said payment bond shall also be executed as a statutory bond and filed in the office of the Clerk of the District Court of the County in which the Project is located. Contractor shall provide the Owner with a certified copy of said statutory bond as so filed.

BONDS FURNISHED shall be written by a SURETY approved by the U.S. Treasury Dept. and licensed to do business in the State of Kansas. No Work shall be commenced until bonds are in force.

FORM OF BOND shall be Statutory Payment Bond – State of Kansas.

POWER OF ATTORNEY for the surety company agent must accompany each bond issued, and must be certified to include the date of the bonds.

PROVIDE TRIPLICATE COPIES of the bond forms and power of attorney.

COST of the bonds shall be included in the bid and paid for by the Contractor.

**END OF SECTION**

# SEDGWICK COUNTY ADULT DETENTION FACILITY
# DOMESTIC WATER HEATER REPLACEMENT

**BOND TO THE STATE OF KANSAS**
**STATUTORY PAYMENT BOND**
(K.S.A. 60-1111, as amended)

WITNESSETH: That _____ ("Principal"), and _____ ("Surety"), are hereby jointly and severally held and firmly bound unto the STATE OF KANSAS in the sum of _____ dollars ($_____) lawful money of the United States of America, for the use and benefit of all persons entitled thereto and for the payment of which we hereby bind ourselves, our successors, assigns, heirs, executors and administrators.

THE CONDITION OF THE OBLIGATION IS SUCH, THAT,

WHEREAS, the Principal has entered into an Agreement with Sedgwick County, Kansas dated _____, 2026, for improvements described as the

**Sedgwick County Adult Detention Facility**
**Domestic Water Heater Replacement**
**141 W. Elm**
**Wichita, KS 67203**
**Bid No. 26-0003**

**(**the "Work") according to the Contract Documents, which are incorporated herein by reference.

NOW, THEREFORE, if the Principal and its subcontractors shall pay all indebtedness incurred for supplies, materials or labor furnished, used or consumed in connection with the Work including gasoline, lubricating oils, fuel oils, grease, coal and similar items used or consumed directly in furtherance of the Work, then this obligation is to be null and void; otherwise to remain in full force and effect.

The Surety covenants and agrees that no change, extension of time, alteration or addition to the Contract Documents or to the Work shall in any way reduce, nullify, or affect the Surety's obligations on this bond; and the Surety hereby waives notice on any such change, extension of time, alteration or additional to said Contract Documents or Work.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed and delivered this _____ day of _____, 2026.

Principal _____

Title _____

Surety _____

Title _____

# SEDGWICK COUNTY ADULT DETENTION FACILITY
# DOMESTIC WATER HEATER REPLACEMENT

## PERFORMANCE BOND

WITNESSETH THAT, _____ ("Principal") and _____ ("Surety") ARE HELD AND FIRMLY BOUND UNTO THE BOARD OF COUNTY COMMISSIONERS OF SEDGWICK COUNTY, KANSAS, (the "County"), for the use and benefit of claimants herein below identified in the amount of:

_____ dollars ($_____).

and in the amount of any change orders issued for the Work, for which payment Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, THAT,

> WHEREAS, Principal has by agreement dated _____, 2026 entered into a contract with the County for the construction described as Sedgwick County Adult Deetntion Facility Domestic Water Heater Replacement in accordance with the Contract Documents.

NOW, THEREFORE, if the Principal shall well and truly perform all the covenants, conditions, and obligations of the Contract Documents and any Addenda and Change Orders and shall hold the County and all interested property owners harmless against all claims, loss, damage, demands, or causes of actions which they may sustain or suffer by reason of any breach of said Contract Documents or of negligence of the Principal or of improper execution of the Work or use of inferior materials by the Principal; and if said Principal shall maintain the improvements as provided for in said Contract Documents and shall make good all defects in material and workmanship for a period of one year, or for such other period as provided for in the Contract Documents; then, this obligation shall be void: Otherwise to remain in full force and effect.

FURTHERMORE, the Surety convents and agrees that no price change, extension of time, alteration, or addition to the terms of the Contract Documents or to the Work to be performed thereunder shall in any way affect Surety's obligation on this bond; and Surety hereby waives notice of any such change, extension of time, alteration or addition to said Contract Documents.

IN WITNESS WHEREOF, the Principal and Surety have duly executed these presents all as of the day and year first above written.

Principal _____

Title _____

Surety _____

Title _____

# SEDGWICK COUNTY ADULT DETENTION FACILITY
# DOMESTIC WATER HEATER REPLACEMENT

**CERTIFIED COPY OF A RESOLUTION**
**OF THE BOARD OF DIRECTORS**
**OF _____**
**A KANSAS CORPORATION**

The undersigned, being the duly elected qualified and acting Secretary of _____, a Kansas corporation (the "Corporation"), hereby certifies as follows:

At a special meeting of the board of directors of the Corporation, held _____, 2026, when meeting was duly and properly called according to the by-laws of the Corporation and at which a quorum of said board was present, the following resolution was passed and adopted:

"WHEREAS, the Corporation desires to contract with Sedgwick County, Kansas (the "County") for the construction of certain public improvements, and,

"WHEREAS, the Corporation desires to authorize certain officers of the Corporation to execute and deliver to the County all agreements and documents related thereto.

"NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF _____, a Kansas corporation, that _____(name),_____(title), of the Corporation, be and is hereby authorized to execute and deliver to the County all contracts and documents incidental thereto, including but not limited to statutory bonds, construction bonds, insurance agreements and policies, plans and specifications, and any further documents required thereby, relating or pertaining to the following described project:

**Sedgwick County Adult Detention Facility**
**Domestic Water Heater Replacement**
**141 W. Elm**
**Wichita, KS 67203**
**Bid No. 26-0003**

"BE IT FURTHER RESOLVED BY THE BOARD OF DIRECTORS OF THE CORPORATION that the authority conferred hereby upon such officer is continuing unless notice in writing be given by the Corporation to the County."

DATED this _____ day of _____, 2026.

_____
Secretary

(SEAL)

# SEDGWICK COUNTY ADULT DETENTION FACILITY
# DOMESTIC WATER HEATER REPLACEMENT
## EXHIBIT A

Liability insurance coverage indicated below must be considered as primary and not as excess insurance. If required, Contractor's professional liability/errors and omissions insurance shall (i) have a policy retroactive date prior to the date any professional services are provided for this project, and (ii) be maintained for a minimum of 3 years past completion of the project. Contractor shall furnish a certificate evidencing such coverage, with County listed as an additional insured including both ongoing and completed operations, except for professional liability, workers' compensation and employer's liability. **Certificate shall be provided prior to award of contract.** Certificate shall remain in force during the duration of the project/services and will not be canceled, reduced, modified, limited, or restricted until thirty (30) days after County receives written notice of such change. All insurance must be with an insurance company with a minimum BEST rating of A-VIII and licensed to do business in the State of Kansas **(must be acknowledged on the bid/proposal response form).**

**NOTE:** If any insurance is subject to a deductible or self-insured retention, written disclosure must be included in your proposal response and also be noted on the certificate of insurance.

It is the responsibility of Contractor to require that any and all approved subcontractors meet the minimum insurance requirements.

| | |
|---|---|
| **Workers' Compensation:** | |
| Applicable coverage per State Statutes | |
| **Employer's Liability Insurance:** | $500,000.00 |
| **Commercial General Liability Insurance (on form CG 00 01 04 13 or it's equivalent)**: | |
| Each Occurrence | $1,000,000.00 |
| General Aggregate, per project | $2,000,000.00 |
| Personal Injury | $1,000,000.00 |
| Products and Completed Operations Aggregate | $2,000,000.00 |
| **Automobile Liability:** | |
| Combined single limit | $500,000.00 |
| **Umbrella Liability:**<br>Following form for both the general liability and automobile<br>**X Required/_____Not Required**<br>Each Claim<br>Aggregate | <br><br><br>$1,000,000.00<br>$1,000,000.00 |
| **Professional Liability/ Errors & Omissions Insurance:**<br>**X Required/_____Not Required**<br>Each Claim<br>Aggregate | <br><br>$1,000,000.00<br>$1,000,000.00 |
| **Pollution Liability Insurance:**<br>**X Required/_____Not Required**<br>Each Claim<br>Aggregate | <br><br>$1,000,000.00<br>$1,000,000.00 |

***Special Risks or Circumstances:***

***Entity reserves the right to modify, by written contract, these requirements, including limits, based on the nature of the risk, prior experience, insurer, coverage, or other special circumstances.***

**CONTRACTOR IS PROVIDING CONSTRUCTION SERVICES:**

*In addition to the above coverages, Contractor shall also provide the following:*

| | |
|---|---|
| **Builder's Risk Insurance:** | In the amount of the initial Contract Sum, plus the value of subsequent modifications and cost of materials supplied and installed by others, comprising the total value for the entire Project on a replacement cost basis without optional deductibles. Entity, Contractor, and all Subcontractors shall be included as named insureds. |

**PROJECT SUBCONTRACTING WORK SHEET**

**Project Name: Sedgwick County Adult Detention Facility Domestic Water Heater Replacement**

**Check here if you are not using subcontractors ____**

| | |
|---|---|
| **Bid #** | 26-0003 |
| **General Contractor** | |
| **Created by** | |

General Contractors shall provide the name, description, DBE classification (type) Minority Certification #, date of work and dollar value for each subcontractor (including lower-tier subcontractors) used to complete the referenced project. Contractors may be required to provide back up documentation to verify information. Each column requires input.

DBE classification type: African American (1); Asian (2); Hispanic (3); Native American (4); other minority (5); Women Owned Business (6). Additional general classifications: Small Business Owner (7); Does not meet any classification (0).

| | Subcontractor Name and Address | Type | Jurisdiction Name & Minority Certification # (if vendor has one) | Description of Services | Date of Work | Dollar Value of work |
|---|---|---|---|---|---|---|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

**Form shall be submitted to Purchasing at the completion of project.**

**FORM OF CONTRACT**

AIA Document A104-2017 with Supplement “Standard Abbreviated Form of Agreement Between Owner and Contractor”.

DRAFT

# AIA® Document A104™ – 2017

## *Standard Abbreviated Form of Agreement Between Owner and Contractor*

**AGREEMENT** made as of the « » day of « » in the year « »
*(In words, indicate day, month and year.)*

**BETWEEN** the Owner:
*(Name, legal status, address and other information)*

Sedgwick County Board of County Commissioners
525 N. Main
Wichita, Kansas 67203

and the Contractor:
*(Name, legal status, address and other information)*

« »« »
« »
« »
« »

for the following Project:
*(Name, location and detailed description)*

« »
« »
« »

The Architect:
*(Name, legal status, address and other information)*

« »« »
« »
« »
« »

The Owner and Contractor agree as follows.

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

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

DRAFT

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TABLE OF ARTICLES





## ARTICLE 1 THE WORK OF THIS CONTRACT

The Contractor shall execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents listed in Article 6 of this Agreement or reasonably inferable by the Contractor from the Contract Documents as necessary to produce the results intended by the Contract Documents to be the responsibility of others.

## ARTICLE 2 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

**§ 2.1** The date of commencement of the Work shall be:
*(Check one of the following boxes.)*

[ « » ] The date of this Agreement.

[ « » ] A date set forth in a notice to proceed issued by the Owner.

[ « » ] Established as follows:
*(Insert a date or a means to determine the date of commencement of the Work.)*

« »

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

**§ 2.2** The Contract Time shall be measured from the date of commencement.

**§ 2.3 Substantial Completion**

**§ 2.3.1** Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
*(Check the appropriate box and complete the necessary information.)*

[ « » ] Not later than « » ( « » ) calendar days from the date of commencement of the Work.

[ « » ] By the following date: « »

**§ 2.3.2** Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

| Portion of Work | Substantial Completion Date |
|---|---|
| | |

**§ 2.3.3** All times stated in the Contract Documents, including, without limitation, those for the commencement, prosecution, interim milestones, and completion of the Work, and for the delivery and installation of materials and equipment, are of the essence in this Agreement.

**§ 2.3.4** The date of substantial completion of the Work or a designated portion thereof is the date, certified by the Architect, when construction is sufficiently complete in accordance with the Contract Documents that the Owner may, if it so elects, occupy and use the Work or designated portion thereof for the purposes for which it was intended.

**§ 2.3.5** If the Contractor fails to achieve Substantial Completion of the Work within the Contract Time and as otherwise required by the Contract Documents, the Owner shall be entitled to retain or recover from the Contractor, as liquidated damages and not as a penalty, the following daily amounts commencing upon the first day following expiration of the Contract Time and continuing until the Date of Substantial Completion. Such liquidated damages are hereby agreed to be a reasonable pre-estimate of damages the Owner will incur as a result of delayed completion of the Work: _____.

**§ 2.3.6** The Owner may deduct liquidated damages as described in the above paragraph from any unpaid amounts then or thereafter due the Contractor under this Agreement. Any liquidated damages not so deducted from any unpaid amounts due the Contractor shall be payable to the Owner at the demand of the Owner, together with interest from the date of the demand at a rate equal to the lower of the Treasury bill rate or the highest lawful rate of interest payable by the Contractor.

## ARTICLE 3 CONTRACT SUM

**§ 3.1** The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's proper performance of the Contract and the completion of the Work. The Contract Sum shall be one of the following:
*(Check the appropriate box.)*

[ « » ] Stipulated Sum, in accordance with Section 3.2 below

[ « » ] Cost of the Work plus the Contractor's Fee, in accordance with Section 3.3 below

[ « » ] Cost of the Work plus the Contractor's Fee with a Guaranteed Maximum Price, in accordance with Section 3.4 below

*(Based on the selection above, complete Section 3.2, 3.3 or 3.4 below.)*

**§ 3.2** The Stipulated Sum shall be « » ($ « » ), subject to additions and deductions as provided in the Contract Documents.

**§ 3.2.1** The Stipulated Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:
*(State the numbers or other identification of accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)*

« »

**§ 3.2.2** Unit prices, if any:
*(Identify the item and state the unit price and the quantity limitations, if any, to which the unit price will be applicable.)*

| Item | Units and Limitations | Price per Unit ($0.00) |
|---|---|---|
| | | |

**§ 3.2.3** Allowances, if any, included in the stipulated sum:
*(Identify each allowance.)*

| Item | Price |
|---|---|
| | |

**§ 3.3 Cost of the Work Plus Contractor's Fee**
**§ 3.3.1** The Cost of the Work is as defined in Exhibit A, Determination of the Cost of the Work.

**§ 3.3.2** The Contractor's Fee:
*(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee and the method of adjustment to the Fee for changes in the Work.)*

« »

**§ 3.4 Cost of the Work Plus Contractor's Fee With a Guaranteed Maximum Price**
**§ 3.4.1** The Cost of the Work is as defined in Exhibit A, Determination of the Cost of the Work.

**§ 3.4.2** The Contractor's Fee:
*(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee and the method of adjustment to the Fee for changes in the Work.)*

« »

**§ 3.4.3 Guaranteed Maximum Price**
**§ 3.4.3.1** The sum of the Cost of the Work and the Contractor's Fee is guaranteed by the Contractor not to exceed « » ($ « » ), subject to additions and deductions by changes in the Work as provided in the Contract Documents. This maximum sum is referred to in the Contract Documents as the Guaranteed Maximum Price. Costs which would cause the Guaranteed Maximum Price to be exceeded shall be paid by the Contractor without reimbursement by the Owner.
*(Insert specific provisions if the Contractor is to participate in any savings.)*

« »

**§ 3.4.3.2** The Guaranteed Maximum Price is based on the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:
*(State the numbers or other identification of accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)*

« »

**§ 3.4.3.3** Unit Prices, if any:
*(Identify the item and state the unit price and the quantity limitations, if any, to which the unit price will be applicable.)*

| Item | Units and Limitations | Price per Unit ($0.00) |
|---|---|---|
| | | |

**§ 3.4.3.4** Allowances, if any, included in the Guaranteed Maximum Price:
*(Identify each allowance.)*

| Item | Price |
|---|---|
| | |

**§ 3.4.3.5** Assumptions, if any, on which the Guaranteed Maximum Price is based:

« »

**§ 3.4.3.6** To the extent that the Contract Documents are anticipated to require further development, the Guaranteed Maximum Price includes the costs attributable to such further development consistent with the Contract Documents and reasonably inferable therefrom. Such further development does not include changes in scope, systems, kinds and quality of materials, finishes or equipment, all of which, if required, shall be incorporated by Change Order.

**§ 3.4.3.7** The Owner shall authorize preparation of revisions to the Contract Documents that incorporate the agreed-upon assumptions contained in Section 3.4.3.5. The Owner shall promptly furnish such revised Contract Documents to the Contractor. The Contractor shall notify the Owner and Architect of any inconsistencies between the agreed-upon assumptions contained in Section 3.4.3.5 and the revised Contract Documents.

« »

## ARTICLE 4 PAYMENT

### § 4.1 Progress Payments

**§ 4.1.1** Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

**§ 4.1.2** The period covered by each Application for Payment shall be one calendar month ending on the last day of the month and the payment shall be less the specified retainage.

« »

**§ 4.1.3** Provided that an Application for Payments is received by the Architect not later than the twenty-fifth (25th) day of a month, the Owner shall make payment to the Contractor not later than the third Friday of the next month. If an Application for Payment is received by the Architect after the date fixed above, payment shall be made by the Owner not later than thirty (30) days after the Architect received the Application for Payment.
*(Federal, state or local laws may require payment within a certain period of time.)*

**§ 4.1.3.1** Notwithstanding anything to the contrary in this Contract, payment of amounts due a Contractor from an Owner, except retainage, shall be made within 30 days after the Owner receives a timely, properly completed, undisputed request for payment according to terms of the contract, unless extenuating circumstances exist which would preclude approval of payment within 30 days. If such extenuating circumstances exist, than payment shall be made within 45 days after the Owner receives such payment request.

**§ 4.1.3.2** If the Owner fails to pay Contractor within the time period set in Paragraph 4.1.3.1, the Owner shall pay interest computed at the rate of eighteen percent (18%) per annum on the undisputed amount to the Contractor beginning on the day following the end of the time period set forth in Paragraph 4.1.3.1.

**§ 4.1.4** For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold retainage from the payment otherwise due as follows:
*(Insert a percentage or amount to be withheld as retainage from each Application for Payment and any terms for reduction of retainage during the course of the Work. The amount of retainage may be limited by governing law.)*

« »

**§ 4.1.5** Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
*(Insert rate of interest agreed upon, if any.)*

« » % « »

**§ 4.2 Final Payment**
**§ 4.2.1** Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

**.1** the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Section 18.2, and to satisfy other requirements, if any, which extend beyond final payment;

**.2** the Contractor has submitted a final accounting for the Cost of the Work, where payment is on the basis of the Cost of the Work with or without a Guaranteed Maximum Price; and

**.3** a final Certificate for Payment has been issued by the Architect in accordance with Section 15.7.1.

**§ 4.2.2** The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

« »

## ARTICLE 5 DISPUTE RESOLUTION

**§ 5.1 Binding Dispute Resolution**
For any claim subject to, but not resolved by, mediation pursuant to Section 21.5, the method of binding dispute resolution shall be as follows:
*(Check the appropriate box.)*

[ « » ] Arbitration pursuant to Section 21.6 of this Agreement

[ « » ] Litigation in a court of competent jurisdiction

[ « » ] Other *(Specify)*

« »

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, claims will be resolved in a court of competent jurisdiction.

## ARTICLE 6 ENUMERATION OF CONTRACT DOCUMENTS

**§ 6.1** The Contract Documents are defined in Article 7 and, except for Modifications issued after execution of this Agreement, are enumerated in the sections below.

**§ 6.1.1** The Agreement is this executed AIA Document A104™–2017, Standard Abbreviated Form of Agreement Between Owner and Contractor.

**§ 6.1.2** AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
*(Insert the date of the E203–2013 incorporated into this Agreement.)*

« »

**§ 6.1.3** The Supplementary and other Conditions of the Contract are those modified and contained in the Project Manual dated _____.

| Document | Title | Date | Pages |
|---|---|---|---|
| | | | |

**§ 6.1.4** The Specifications:
*(Either list the Specifications here or refer to an exhibit attached to this Agreement.)*

« »

| Section | Title | Date | Pages |
|---|---|---|---|
| | | | |

**§ 6.1.5** The Drawings:
*(Either list the Drawings here or refer to an exhibit attached to this Agreement.)*

« »

| Number | Title | Date |
|---|---|---|
| | | |

**§ 6.1.6** The Addenda, if any:

| Number | Date | Pages |
|---|---|---|
| | | |

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are enumerated in this Article 6.

**§ 6.1.7** Additional documents, if any, forming part of the Contract Documents:

**.1** Other Exhibits:
*(Check all boxes that apply.)*

[ « » ] Exhibit A, Determination of the Cost of the Work.

[ « » ] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
*(Insert the date of the E204-2017 incorporated into this Agreement.)*

« »

[ « » ] The Sustainability Plan:

| Title | Date | Pages |
|---|---|---|
| | | |

[ « » ] Supplementary and other Conditions of the Contract:

| Document | Title | Date | Pages |
|---|---|---|---|
| | | | |

.2 Other documents, if any, listed below:
*(List here any additional documents that are intended to form part of the Contract Documents.)*

« »

## ARTICLE 7 GENERAL PROVISIONS

### § 7.1 The Contract Documents

The Contract Documents are enumerated in Article 6 and consist of this Agreement (including, if applicable, Supplementary and other Conditions of the Contract), Drawings, Specifications, Addenda issued prior to the execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results. In the event of inconsistencies within or between parts of the Contracts Documents, or between the Contract Documents and applicable standards, codes, resolutions, and ordinances, the Contract shall (i) provide the better quality or greater quantity of Work or (ii) comply with the more stringent requirement, either or both in accordance with the Architect's interpretation. The terms and conditions of this Paragraph 7.1, however, shall not relieve the Contractor of any obligations set forth in Paragraphs 9.1 and 9.6.

### § 7.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind between any persons or entities other than the Owner and the Contractor.

### § 7.3 The Work

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

### § 7.4 Instruments of Service

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

### § 7.5 Ownership and use of Drawings, Specifications and Other Instruments of Service

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

**§ 7.5.2** The Contractor, Subcontractors, Sub-subcontractors and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to the protocols established pursuant to Sections 7.6 and 7.7, solely

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

### § 7.6 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

### § 7.7 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

### § 7.8 Severability

The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

### § 7.9 Notice

**§ 7.9.1** Except as otherwise provided in Section 7.9.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
*(If other than in accordance with AIA Document E203–2013, insert requirements for delivering Notice in electronic format such as name, title and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)*

« »

**§ 7.9.2** Notice of Claims shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

### § 7.10 Relationship of the Parties

Where the Contract is based on the Cost of the Work plus the Contractor's Fee, with or without a Guaranteed Maximum Price, the Contractor accepts the relationship of trust and confidence established by this Agreement and covenants with the Owner to cooperate with the Architect and exercise the Contractor's skill and judgment in furthering the interests of the Owner; to furnish efficient business administration and supervision; to furnish at all times an adequate supply of workers and materials; and to perform the Work in an expeditious and economical manner consistent with the Owner's interests. The Owner agrees to furnish and approve, in a timely manner, information required by the Contractor and to make payments to the Contractor in accordance with the requirements of the Contract Documents.

## ARTICLE 8 OWNER

### § 8.1 Information and Services Required of the Owner

**§ 8.1.1** Prior to commencement of the Work, at the written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such

evidence. If commencement of the Work is delayed under this Section 8.1.1, the Contract Time shall be extended appropriately.

**§ 8.1.2** The Owner shall furnish all necessary surveys and a legal description of the site.

**§ 8.1.3** The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

**§ 8.1.4** Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 9.6.1, the Owner shall secure and pay for other necessary approvals, easements, assessments, and charges required for the construction, use, or occupancy of permanent structures or for permanent changes in existing facilities.

### § 8.2 Owner's Right to Stop the Work

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

### § 8.3 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents, and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to any other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 15.4.3, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including the Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 21.

### § 8.4 Extent of Owner's Rights

**§ 8.4.1** The rights stated in this Article 8 and elsewhere in the Contract Documents are cumulative and not in limitation of any rights of the Owner (i) granted in the Contract Documents, (ii) in law, or (iii) in equity.

**§ 8.4.2** In no event shall Owner have control over, charge of, or any responsibility for construction means, methods, techniques, sequences, or procedures or for the safety precautions and programs in connection with the Work, notwithstanding any of the rights and authority granted the Owner in the Contract Document.

## ARTICLE 9 CONTRACTOR

### § 9.1 Review of Contract Documents and Field Conditions by Contractor

**§ 9.1.1** Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents. Prior to execution of the Agreement, the Contractor and each Subcontractor shall evaluate and satisfy themselves as to the conditions and limitations under which the Work is to be performed, including, without limitation, (i) the location, condition, layout, and nature of the Project site and surrounding areas, (ii) generally prevailing climactic conditions, (iii) anticipated labor supply and costs, (iv) availability and cost of materials, tools, and equipment, and (v) other similar issues. The Owner assumes no responsibility or liability for the physical condition or safety of the Project site or any improvements located on the Project site. Except as set forth in Paragraph 16.2, the Contractor shall be solely responsible for providing a safe place for the performance of the Work. The Owner shall not be required to make any adjustment in either the contract Sum or Contract Time in connection with any failure by the Contractor or any Subcontractor to have complied with the requirements of this Paragraph 9.1.1.

**§ 9.1.2** Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 8.1.2, shall take field measurements of any existing

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

**§ 9.1.2.1** The exactness of grades, elevations, dimensions, or locations given on any Drawings issued by the Architect, or the work installed by other contractors, is not guaranteed by the Architect or the owner.

**§ 9.1.2.2** The Contractor shall, therefore, satisfy itself to the accuracy of all grades, elevations, dimensions, and locations. In all cases of interconnection of its Work with existing or other work, it shall verify at the site all dimensions relating to such existing or other work. Any errors due to the Contractor's failure to so verify all such grades, elevations, dimensions, or locations shall be promptly rectified by the Contractor without any additional cost to the Owner.

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

### § 9.2 Supervision and Construction Procedures

**§ 9.2.1** The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters.

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

### § 9.3 Labor and Materials

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

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

**§ 9.3.3** The Contractor may make a substitution only with the consent of the Owner, after evaluation by the Architect and in accordance with a Modification.

**§ 9.3.4** The Contractor shall deliver, handle, store, and install materials in accordance with manufacturers' instructions.

### § 9.4 Warranty

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

and shall commence in accordance with Section 15.6.3. The Contractor agrees to assign to the Owner at the time of final completion of the Work any and all manufacturer's warranties relating to materials and labor used in the Work and further agrees to perform the Work in such a manner so as to preserve any and all such manufacturer's warranties.

**§ 9.5 Taxes**

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

**§ 9.5.1 Materials**

**§ 9.5.1.1** Materials and equipment incorporated into this Project are exempt from the payment of sales tax under the laws of the State of Kansas.

**§ 9.5.1.2** The owner will provide the contractor with a proper exemption certificate number when the notice to proceed is issued. Should the Owner fail to provide an exemption certification the Contractor shall notify the Architect in writing prior to placing any orders. The contractor shall be reimbursed for sales tax amounts for which he becomes liable until such exemption is provided.

**§ 9.5.1.3** Upon issuance of a proper exemption certification number to the Contractor, the Contractor shall assume full responsibility for his own assessed penalties relating to the Contractor's improper use of the exemption certificate. Contractor shall comply with statutes of the State of Kansas related to sales tax exemption.

**§ 9.5.1.4** The Contractor shall be responsible for furnishing the Owner a copy of all invoices bearing the exemption certification number pertaining to materials that are incorporated in this project.

**§ 9.5.1.5** Contractor shall retain, for a period of not less than five years, all his and his subcontractor's invoices claiming sales tax exemption, properly identified with tax exemption number as required by State of Kansas.

**§ 9.5.1.6** Upon completion of the Project, the Contractor shall execute and issue, to the Owner, a certificate of compliance on the form provided by the State Department of Revenue.

**§ 9.6 Permits, Fees, Notices, and Compliance with Laws**

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

**§ 9.6.2** The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules, regulations and lawful orders of public authorities applicable to performance of the Work. The Contractor shall promptly notify the Architect and Owner if the Drawings and Specifications are observed by the Contractor to be at variance therewith. If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, without such notice to the Architect and Owner, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

**§ 9.7 Allowances**

The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. The Owner shall select materials and equipment under allowances with reasonable promptness. Allowance amounts shall include the costs to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts. Contractor's costs for unloading and handling at the site, labor, installation, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowance.

**§ 9.8 Contractor's Construction Schedules**

**§ 9.8.1** The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work

and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

**§ 9.8.2** The Contractor shall perform the Work in general accordance with the most recent schedule submitted to the Owner and Architect.

### § 9.9 Submittals

**§ 9.9.1** The Contractor shall review for compliance with the Contract Documents and submit to the Architect Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents in coordination with the Contractor's construction schedule and in such sequence as to allow the Architect reasonable time for review. By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them; (2) determined and verified materials, field measurements, and field construction criteria related thereto, or will do so; and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents. The Work shall be in accordance with approved submittals.

**§ 9.9.2** Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents.

**§ 9.9.3** The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents or unless the Contractor needs to provide such services in order to carry out the Contractor's own responsibilities. If professional design services or certifications by a design professional are specifically required, the Owner and the Architect will specify the performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional. If no criteria are specified, the design shall comply with applicable codes and ordinances. Each Party shall be entitled to rely upon the information provided by the other Party. The Architect will review and approve or take other appropriate action on submittals for the limited purpose of checking for conformance with information provided and the design concept expressed in the Contract Documents. The Architect's review of Shop Drawings, Product Data, Samples, and similar submittals shall be for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. In performing such review, the Architect will approve, or take other appropriate action upon, the Contractor's Shop Drawings, Product Data, Samples, and similar submittals.

### § 9.10 Use of Site

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

**§ 9.10.1** Only materials and equipment that are to be used directly in the Work shall be brought to and stored on the Project site by the Contractor. After equipment is no longer required for the Work, it shall be promptly removed from the Project site. Protection of construction materials and equipment stored at the Project site from weather, theft, damage, and all other adversity is solely the responsibility of the Contractor. The Contractor shall ensure that the Work, at all times, is performed in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent areas. The Work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the site of the Work shall be free from all debris, building materials, and equipment likely to cause hazardous conditions.

**§ 9.10.2** The Contractor and any such entity for whom the Contractor is responsible shall not erect any sign on the Project site without the prior written consent of the Owner, which may be withheld in the sole discretion of the Owner.

**§ 9.10.3** Without limitation of any other provision of the Contract Documents, Contractor shall use best efforts to minimize any interference with the occupancy or beneficial use of (i) any areas and building adjacent to the site of the Work, and (ii) the Building, in the event of partial occupancy. Without prior approval of the Owner, the Contractor shall not permit any workers to use any existing facilities at the Project site, including, without limitation, lavatories, toilets, entrances, and parking areas other than those designated by the Owner.

**§ 9.10.3.1** Without limitation of any other provision of the Contract Documents, the Contractor shall use its best efforts to comply with all resolutions, rules and regulations promulgated by the Owner in connection with the use

and occupancy of the Project site and the Building, as amended for time to time. The Contractor shall immediately notify the Owner in writing if during the performance of the Work, the Contractor finds compliance with any portion of such resolutions, rules and regulations to be impracticable, setting forth the problems of such compliance and suggesting alternatives through which the same result intended by such portions of the resolutions, rules and regulations can be achieved. The Owner may, in the Owner's sole discretion, adopt such suggestions, develop new alternatives, or require compliance with the existing requirements of the resolutions, rules and regulations. In the even Owner requires compliance with subsequently adopted resolutions, rules and regulations, any resulting change in the Work shall be adjusted as provided in Article 13 of the Contract.

**§ 9.10.4** The Contractor shall comply with all insurance requirements and collective bargaining agreements applicable to use and occupancy of the Project site and the Building.

### § 9.11 Cutting and Patching

The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly.

### § 9.12 Cleaning Up

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

### § 9.13 Access to Work

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

### § 9.14 Royalties, Patents and Copyrights

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

### § 9.15 Indemnification

**§ 9.15.1** To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) (including loss of use resulting therefrom), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 9.15.1.

**§ 9.15.2** In claims against any person or entity indemnified under this Section 9.15 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 9.15.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

**§ 9.15.3** The Contractor's indemnity obligations under this Paragraph 9.15 shall also specifically include, without limitation, all fines, penalties, damages, liability, costs, and expenses (including, without limitation, reasonable attorney's fees) arising out of, or in connection with, any (i) violation of or failure to comply with any law, statute, resolution, ordinance, rule, regulation, code, or requirement of a public authority that bears upon the performance of the Work by the Contractor, a Subcontractor, or any person or entity for whom either is responsible, (ii) means, methods, procedures, techniques, or sequences of execution or performance of the Work, and (iii) failure to secure

and pay for permits, fees, approvals, licenses, and inspections, as required under the Contract Documents, or any violation of any permit of other approval of a public authority applicable to the Work by the Contractor, a Subcontractor, or any person or entity for whom either is responsible.

**§ 9.15.4** The Contractor shall indemnify and hold harmless all of the Indemnitees from and against any costs and expenses (including reasonable attorneys' fees) incurred by any of the Indemnitees in enforcing any of the Contractor's defense, indemnity, and hold harmless obligations under this Contract.

## ARTICLE 10 ARCHITECT

**§ 10.1** The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction, until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified in writing in accordance with other provisions of the Contract.

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

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

**§ 10.4** On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

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

**§ 10.6** The Architect has authority to reject Work that does not conform to the Contract Documents and to require inspection or testing of the Work.

**§ 10.7** The Architect will review and approve or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

**§ 10.8** The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect will make initial decisions on all claims, disputes, and other matters in question between the Owner and Contractor but will not be liable for results of any interpretations or decisions rendered in good faith.

**§ 10.9** The Architect's decisions on matters relating to aesthetic effect, in connection with administration of the Contract, will be final if consistent with the intent expressed in the Contract Documents.

## ARTICLE 11 SUBCONTRACTORS

**§ 11.1** A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site.

**§ 11.2** Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the Subcontractors or suppliers proposed for each of the principal portions of the Work. The Contractor shall not contract with any Subcontractor or supplier to whom the Owner or Architect has made reasonable written objection within ten days after receipt of the Contractor's list of Subcontractors and suppliers. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

**§ 11.3** Contracts between the Contractor and Subcontractors shall (1) require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by the Contract Documents, assumes toward the Owner and Architect, and (2) allow the Subcontractor the benefit of all rights, remedies and redress against the Contractor that the Contractor, by these Contract Documents, has against the Owner.

## ARTICLE 12 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

**§ 12.1** The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

**§ 12.2** The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's activities with theirs as required by the Contract Documents.

**§ 12.3** The Owner shall be reimbursed by the Contractor for costs incurred by the Owner which are payable to a Separate Contractor because of delays, improperly timed activities, or defective construction of the Contractor. The Owner shall be responsible to the Contractor for costs incurred by the Contractor because of delays, improperly timed activities, damage to the Work, or defective construction of a Separate Contractor.

**§ 12.4** The Contractor shall, as part of the Work, provide for the coordination of work to be performed by each separate contractor engaged by the Owner, if any, with the work to be performed by the Contractor or its Subcontractors of any tier. The Contractor shall use its best efforts to cooperate with the Owner and all separate contractors, their subcontractors, and any other entity involved in the performance of the Work. In order to cause the Work and any work to be performed by separate contractors to be completed in an expeditious manner, the Contractor agrees that it will ensure that such separate contractors have a reasonable opportunity to complete their work as and when required.

**§ 12.5** If any part of the Work depends on the proper performance of the work of a separate contractor, the Contractor shall, prior to proceeding with the Work, promptly report to the Owner any apparent discrepancies or defects in such other work that render it unsuitable and prevent the Contractor from proceeding expeditiously with the Work.

**§ 12.6** If the Contractor wrongfully causes damage to the Work or the property of the Owner, the Contractor shall promptly remedy such damage. If the Contractor wrongfully causes damage to the work or property of any separate contractor, the Contractor shall promptly attempt to settle any resulting dispute or claim with such other contractor.

## ARTICLE 13 CHANGES IN THE WORK

**§ 13.1** By appropriate Modification, changes in the Work may be accomplished after execution of the Contract. The Owner, without invalidating the Contract, may order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, with the Contract Sum and Contract Time being adjusted accordingly. Such changes in the Work shall be authorized by written Change Order signed by the Owner, Contractor, and Architect, or by written Construction Change Directive signed by the Owner and Architect. Upon

issuance of the Change Order or Construction Change Directive, the Contractor shall proceed promptly with such changes in the Work, unless otherwise provided in the Change Order or Construction Change Directive.

**§ 13.2** Adjustments in the Contract Sum and Contract Time resulting from a change in the Work shall be determined by mutual agreement of the parties or, in the case of a Construction Change Directive signed only by the Owner and Architect, by the Contractor's cost of labor, material, equipment, and reasonable overhead and profit, unless the parties agree on another method for determining the cost or credit. Pending final determination of the total cost of a Construction Change Directive, the Contractor may request payment for Work completed pursuant to the Construction Change Directive. The Architect will make an interim determination of the amount of payment due for purposes of certifying the Contractor's monthly Application for Payment. When the Owner and Contractor agree on adjustments to the Contract Sum and Contract Time arising from a Construction Change Directive, the Architect will prepare a Change Order.

**§ 13.3** The Architect will have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work.

**§ 13.4** If concealed or unknown physical conditions are encountered at the site that differ materially from those indicated in the Contract Documents or from those conditions ordinarily found to exist, the Contract Sum and Contract Time shall be equitably adjusted as mutually agreed between the Owner and Contractor; provided that the Contractor provides notice to the Owner and Architect promptly and before conditions are disturbed. No adjustment in the Contract Time or Contract Sum shall be permitted, however, in connection with a concealed or unknown condition that does not differ materially from those conditions disclosed or that reasonably should have been disclosed by the Contractor's (i) prior inspections, tests, reviews, and preconstruction services for the Project, or (ii) inspections, tests, reviews, and preconstruction services that the Contractor had the opportunity to make or should have performed in connection with the Project.

**§ 13.5** Except as permitted in Paragraph 12.1, a change in the Contract Sum or the Contract Time shall be accomplished only by a Change Order. Accordingly, no course of conduct or dealings between the parties, nor express or implied acceptance of alterations or additions to the Work, and no claim that the Owner has been unjustly enriched by any alteration or addition to the Work, whether or not there is, in fact, any unjust enrichment to the Work, shall be the basis of any claim to an increase in any amounts due under the Contract Documents or a change in any time period provided for in the Contract Documents.

**§ 13.6** Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the Work that is the subject of the Change Order, including but not limited to, all direct and indirect costs associated with such change and any and all adjustments to the Contract Sum and the construction schedule.

## ARTICLE 14 TIME

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

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

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

**§ 14.4** The date of Substantial Completion is the date certified by the Architect in accordance with Section 15.6.3.

**§ 14.5** If the Contractor is delayed at any time in the commencement or progress of the Work by (1) changes ordered in the Work; (2) by labor disputes, fire, unusual delay in deliveries, abnormal adverse weather conditions not reasonably anticipatable, unavoidable casualties, or any causes beyond the Contractor's control; or (3) by other

causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine, subject to the provisions of Article 21.

## ARTICLE 15 PAYMENTS AND COMPLETION

### § 15.1 Schedule of Values

**§ 15.1.1** Where the Contract is based on a Stipulated Sum or the Cost of the Work with a Guaranteed Maximum Price pursuant to Section 3.2 or 3.4, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Stipulated Sum or Guaranteed Maximum Price to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy required by the Architect. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

**§ 15.1.2** The allocation of the Stipulated Sum or Guaranteed Maximum Price under this Section 15.1 shall not constitute a separate stipulated sum or guaranteed maximum price for each individual line item in the schedule of values.

### § 15.2 Control Estimate

**§ 15.2.1** Where the Contract Sum is the Cost of the Work, plus the Contractor's Fee without a Guaranteed Maximum Price pursuant to Section 3.3, the Contractor shall prepare and submit to the Owner a Control Estimate within 14 days of executing this Agreement. The Control Estimate shall include the estimated Cost of the Work plus the Contractor's Fee.

**§ 15.2.2** The Control Estimate shall include:

- **.1** the documents enumerated in Article 6, including all Modifications thereto;
- **.2** a list of the assumptions made by the Contractor in the preparation of the Control Estimate to supplement the information provided by the Owner and contained in the Contract Documents;
- **.3** a statement of the estimated Cost of the Work organized by trade categories or systems and the Contractor's Fee;
- **.4** a project schedule upon which the Control Estimate is based, indicating proposed Subcontractors, activity sequences and durations, milestone dates for receipt and approval of pertinent information, schedule of shop drawings and samples, procurement and delivery of materials or equipment the Owner's occupancy requirements, and the date of Substantial Completion; and
- **.5** a list of any contingency amounts included in the Control Estimate for further development of design and construction.

**§ 15.2.3** When the Control Estimate is acceptable to the Owner and Architect, the Owner shall acknowledge it in writing. The Owner's acceptance of the Control Estimate does not imply that the Control Estimate constitutes a Guaranteed Maximum Price.

**§ 15.2.4** The Contractor shall develop and implement a detailed system of cost control that will provide the Owner and Architect with timely information as to the anticipated total Cost of the Work. The cost control system shall compare the Control Estimate with the actual cost for activities in progress and estimates for uncompleted tasks and proposed changes. This information shall be reported to the Owner, in writing, no later than the Contractor's first Application for Payment and shall be revised and submitted with each Application for Payment.

**§ 15.2.5** The Owner shall authorize preparation of revisions to the Contract Documents that incorporate the agreed-upon assumptions contained in the Control Estimate. The Owner shall promptly furnish such revised Contract Documents to the Contractor. The Contractor shall notify the Owner and Architect of any inconsistencies between the Control Estimate and the revised Contract Documents.

### § 15.3 Applications for Payment

**§ 15.3.1** At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 15.1, for completed portions of the Work. The application shall be notarized, if required; be supported by all data substantiating the Contractor's right to payment that the Owner or Architect require; shall reflect retainage if provided for in the Contract Documents; and include any revised cost control information required by Section 15.2.4. Applications for Payment shall not include requests for payment for portions of the Work for which the

Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

**§ 15.3.2** With each Application for Payment where the Contract Sum is based upon the Cost of the Work, or the Cost of the Work with a Guaranteed Maximum Price, the Contractor shall submit payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached, and any other evidence required by the Owner to demonstrate that cash disbursements already made by the Contractor on account of the Cost of the Work equal or exceed progress payments already received by the Contractor plus payrolls for the period covered by the present Application for Payment, less that portion of the progress payments attributable to the Contractor's Fee.

**§ 15.3.3** Payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment stored, and protected from damage, off the site at a location agreed upon in writing.

**§ 15.3.4** The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or other encumbrances adverse to the Owner's interests.

**§ 15.3.5** Partial payments will be made monthly on proper application. Certification will be issued for ninety percent (90%) of the amount requested by the Contractor and approved by the Architect to be properly due until at least fifty percent (50%) of the Contract amount has been paid. Thereafter, the accumulated retainage will remain at five percent (5%) of the Contract amount (including additions, if any) except that should the Contractor at any time fail to keep current with the approved progress schedule, certification of ninety percent (90%) shall automatically again become effective and shall apply so long as the Contract progress lags behind such progress schedule.

**§ 15.4 Certificates for Payment**

**§ 15.4.1** The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner of the Architect's reasons for withholding certification in whole or in part as provided in Section 15.4.3.

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

**§ 15.4.3** The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 15.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 15.4.1. If the Contractor and the Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 9.2.2, because of

**.1** defective Work not remedied;

.2 third-party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;

.3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

.5 damage to the Owner or a Separate Contractor;

.6 reasonable evidence that the Work will not be completed within the Contract Time and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or

.7 repeated failure to carry out the Work in accordance with the Contract Documents.

**§ 15.4.4** When either party disputes the Architect's decision regarding a Certificate for Payment under Section 15.4.3, in whole or in part, that party may submit a Claim in accordance with Article 21.

### § 15.5 Progress Payments

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

**§ 15.5.2** Neither the Owner nor Architect shall have an obligation to pay or see to the payment of money to a Subcontractor or supplier except as may otherwise be required by law.

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

**§ 15.5.4** Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

### § 15.6 Substantial Completion

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

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

**§ 15.6.3** Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. When the Architect determines that the Work or designated portion thereof is substantially complete, the Architect will issue a Certificate of Substantial Completion which shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

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

### § 15.7 Final Completion and Final Payment

**§ 15.7.1** Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions stated in Section 15.7.2 as precedent to the Contractor's being entitled to final payment have been fulfilled. All warranties, guarantees, operational and parts manuals required under or pursuant to the Contract Documents shall be assembled and delivered by the Contractor to the Architect as part of the final Application for Payment. The final certificate of Payment will not be issued by the Architect until all warranties and guarantees have been received and accepted by the Owner.

**§ 15.7.2** Final payment shall not become due until the Contractor has delivered to the Owner a complete release of all liens arising out of this Contract or receipts in full covering all labor, materials and equipment for which a lien could be filed, or a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including costs and reasonable attorneys' fees.

**§ 15.7.3** The making of final payment shall constitute a waiver of claims by the Owner except those arising from

- **.1** liens, claims, security interests or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

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

## ARTICLE 16 PROTECTION OF PERSONS AND PROPERTY

### § 16.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract. The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

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

The Contractor shall comply with, and give notices required by, applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on safety of persons and property and their protection from damage, injury, or loss. The Contractor shall promptly remedy damage and loss to property caused in whole or in part by the Contractor, a Subcontractor, a sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 16.1.2 and 16.1.3. The Contractor may make a claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 9.15. When all or a portion of the Work is suspended for any reason, the Contractor shall securely fasten down all coverings and protect the Work, as necessary, from injury by any cause. The Contractor shall promptly report in writing to the Owner and Architect all accidents arising out of or in connection with the Work that cause death, personal injury, or property damage, giving full details and statements of any witnesses. In addition, if death, serious personal injuries, or serious damages are caused, the accident shall be reported immediately by telephone or messenger to the Owner and the Architect.

### § 16.2 Hazardous Materials and Substances

**§ 16.2.1** The Contractor is responsible for compliance with the requirements of the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents, and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

## ARTICLE 17 INSURANCE AND BONDS

### § 17.1 Contractor's Insurance

**§ 17.1.1** The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in this Section 17.1 or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the insurance required by this Agreement from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 18.4, unless a different duration is stated below:

« »

**§ 17.1.2** Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than « » ($ « » ) each occurrence, « » ($ « » ) general aggregate, and « » ($ « » ) aggregate for products-completed operations hazard, providing coverage for claims including

- **.1** damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
- **.2** personal and advertising injury;
- **.3** damages because of physical damage to or destruction of tangible property, including the loss of use of such property;
- **.4** bodily injury or property damage arising out of completed operations; and
- **.5** the Contractor's indemnity obligations under Section 9.15.

**§ 17.1.3** Automobile Liability covering vehicles owned by the Contractor and non-owned vehicles used by the Contractor, with policy limits of not less than « » ($ « » ) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance, and use of those motor vehicles along with any other statutorily required automobile coverage.

**§ 17.1.4** The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as those required under Section 17.1.2 and 17.1.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

**§ 17.1.5** Workers' Compensation at statutory limits.

**§ 17.1.6** Employers' Liability with policy limits not less than « » ($ « » ) each accident, « » ($ « » ) each employee, and « » ($ « » ) policy limit.

**§ 17.1.7** If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than « » ($ « » ) per claim and « » ($ « » ) in the aggregate.

**§ 17.1.8** If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than « » ($ « » ) per claim and « » ($ « » ) in the aggregate.

**§ 17.1.9** Coverage under Sections 17.1.7 and 17.1.8 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than « » ($ « » ) per claim and « » ($ « » ) in the aggregate.

**§ 17.1.10** The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Section 17.1 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the period required by Section 17.1.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy.

**§ 17.1.11** The Contractor shall disclose to the Owner any deductible or self- insured retentions applicable to any insurance required to be provided by the Contractor.

**§ 17.1.12** To the fullest extent permitted by law, the Contractor shall cause the commercial liability coverage required by this Section 17.1 to include (1) the Owner, the Architect, and the Architect's Consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's Consultants, CG 20 32 07 04.

**§ 17.1.13** Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by this Section 17.1, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

**§ 17.1.14 Other Insurance Provided by the Contractor**
*(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)*

| Coverage | Limits |
| --- | --- |
| | |

**§ 17.2 Owner's Insurance**

**§ 17.2.2 Property Insurance**
**§ 17.2.2.1** The Contractor shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, builder's risk insurance with a deductible not to exceed $1000.00 and sufficient to cover the total value of the entire Project on a replacement cost basis. The Contractor's builder's risk insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed or materials or equipment supplied by others. The builder's risk insurance shall be maintained until Substantial Completion and thereafter as provided in Section 17.2.2.2, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

**§ 17.2.2.2** Unless the parties agree otherwise, upon Substantial Completion, the Contractor shall continue the insurance required by Section 17.2.2.1 or, if necessary, replace the insurance policy required under Section 17.2.2.1 with builder's risk insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 18.4.

**§ 17.2.2.3** If the insurance required by this Section 17.2.2 is subject to deductibles or self-insured retentions, the Contractor shall be responsible for all loss not covered because of such deductibles or retentions.

**§ 17.2.2.4** If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Contractor shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 18.4, builder's risk insurance with a deductible not to exceed $1000.00, on a replacement cost basis, protecting the existing structure against direct physical loss or damage, notwithstanding the undertaking of the Work. The Contractor shall be responsible for all co-insurance penalties.

**§ 17.2.2.5** Prior to commencement of the Work, the Contractor shall secure the insurance, and provide evidence of the coverage, required under this Section 17.2.2 and, upon the Owner's request, provide a copy of the insurance policy or policies required by this Section 17.2.2. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

**§ 17.2.2.6** Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by this Section 17.2.2, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Owner: (1) the Owner, upon receipt of notice from the Contractor, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Contractor or the Owner and (2) the Contract Time and Contract Sum shall be equitably adjusted. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide required insurance.

**§ 17.2.2.7 Waiver of Subrogation**

**§ 17.2.2.7.1** The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by this Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this Section 17.2.2.7 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

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

**§ 17.2.3 Other Insurance Provided by the Contractor**

*(List below any other insurance coverage to be provided by the Owner and any applicable limits.)*

| Coverage | Limits |
| --- | --- |
| | |

**§ 17.3 Performance Bond and Payment Bond**

**§ 17.3.1** The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in the Contract Documents on the date of execution of the Contract.

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

## ARTICLE 18 CORRECTION OF WORK

**§ 18.1** The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed, or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense, unless compensable under Section A.1.7.3 in Exhibit A, Determination of the Cost of the Work. If prior to the date of Substantial Completion (for the purposes of this Agreement, a project is substantially complete when the Owner can legally take occupancy and use the facility for its intended purpose), the Contractor, a Subcontractor, or anyone for whom either is responsible uses or damages any portion of the Work, including, without limitation, mechanical, electrical, plumbing, and other building systems, machinery, equipment, or other mechanical device, the Contractor shall cause such item to be restored to "like new" condition at no expense to the Owner.

**§ 18.2** In addition to the Contractor's obligations under Section 9.4, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 15.6.3, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor. The Owner shall, prior to making any written claim, provide the Contractor with an opportunity to make the corrections.

**§ 18.3** If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may correct it in accordance with Section 8.3.

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

**§ 18.5** Upon completion of any Work under or pursuant to this Article 18, the one (1) year correction period in connection with the Work requiring correction shall be renewed and recommence. The obligations under Article 18 shall cover any repairs and replacement to any part of the Work or other property caused by the defective Work.

## ARTICLE 19 MISCELLANEOUS PROVISIONS

### § 19.1 Assignment of Contract

Neither party to the Contract shall assign the Contract without written consent of the other, except that the Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

### § 19.2 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 21.6.

### § 19.3 Tests and Inspections

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

**§ 19.4** The Owner's representative:
*(Name, address, email address and other information)*

« »
« »
« »
« »
« »
« »

**§ 19.5** The Contractor's representative:
*(Name, address, email address and other information)*

« »
« »
« »
« »
« »
« »

**§ 19.6** Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

## ARTICLE 20 TERMINATION OF THE CONTRACT

### § 20.1 Termination by the Contractor

If the Architect fails to certify payment as provided in Section 15.4.1 for a period of 30 days through no fault of the Contractor, or if the Owner fails to make payment as provided in Section 4.1.3 for a period of 30 days, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

### § 20.2 Termination by the Owner for Cause

**§ 20.2.1** The Owner may terminate the Contract if the Contractor

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

**§ 20.2.2** When any of the reasons described in Section 20.2.1 exists, the Owner, upon certification by the Architect that sufficient cause exists to justify such action, may, without prejudice to any other remedy the Owner may have and after giving the Contractor seven days' notice, terminate the Contract and take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor and may finish the Work by whatever reasonable method the Owner may deem expedient. Upon request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

**§ 20.2.3** When the Owner terminates the Contract for one of the reasons stated in Section 20.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

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

**§ 20.3 Termination by the Owner for Convenience**

The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause. The Owner shall pay the Contractor for Work executed; and costs incurred by reason of such termination, including costs attributable to termination of Subcontracts.

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

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

**§ 20.3.2.1** cease operations as directed by the Owner in the notice;

**§ 20.3.2.2** take actions necessary, or that the Owner may direct, for the protection and preservation of the Work;

**§ 20.3.2.3** except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

**§ 20.3.3** Upon such termination, the Contractor shall recover as its sole remedy payment for Work properly performed in connection with the terminated portion of the Work prior to the effective date of termination and for items properly and timely fabricated off the Project site, delivered, and stored in accordance with the Owner's instructions. The Contractor hereby waives and forfeits all other claims for payment and damages, including, without limitation, anticipated profits. Owner shall be credited for (i) payments previously made to the Contractor for the terminated portion of the work, (ii) claims that the Owner has against the Contractor under the Contract, and (iii) the value of the materials, supplies, equipment, or other items that are to be disposed of by the Contractor that are part of the Contract Sum.

**ARTICLE 21 CLAIMS AND DISPUTES**

**§ 21.1** Claims, disputes, and other matters in question arising out of or relating to this Contract, including those alleging an error or omission by the Architect but excluding those arising under Section 16.2, shall be referred initially to the Architect for decision if the claimant recognizes the claim prior to the date of final payment. The Contractor and Owner shall not be obligated to resolve any claim, dispute or other matters related to the contract by mediation or arbitration. Any reference in the contract documents to mediation or arbitration is deemed void.

**§ 21.2 Notice of Claims**

**§ 21.2.1** Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 18.2, shall be initiated by notice to the Architect within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

**§ 21.2.2** Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 18.2, shall be initiated by notice to the other party.

**§ 21.3 Time Limits on Claims**

The Owner and Contractor shall commence all claims and causes of action against the other and arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in this Agreement whether in contract, tort, breach of warranty, or otherwise, within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 21.3.

**§ 21.10 Continuing Contract Performance**

Pending final resolution of a Claim, except as otherwise agreed in writing, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

**ARTICLE 22 Other Conditions or Provisions**

**§ 22.1** Contractor shall observe the provisions of the Kansas Acts Against Discrimination and shall not discriminate against any person in the performance of work under the present agreement because of race, religion, color, sex, disability, national origin or ancestry.

**§ 22.2** In all solicitation or advertisements for employees, Contractor shall include the phrase "equal opportunity employer" or a similar phrase to be approved by the Kansas Human Rights Commission.

**§ 22.3** If Contractor fails to comply with the manner in which Contractor reports to the Kansas Human Rights Commission in accordance with the provisions of K.S.A. 44-1031 and amendments thereto, Contractor shall be deemed to have breached the present contract and it may be canceled, terminated, or suspended in whole or in part, by Sedgwick County (Owner).

**§ 22.4** If Contractor is found guilty of a violation of the Kansas Acts Against Discrimination under a decision of order of the Kansas Human Rights Commission which has become final, Contractor shall be deemed to have breached the present agreement and it may be canceled, terminated or suspended, in whole or in part, by Sedgwick County (Owner).

**§ 22.5** Contractor shall include the provisions of the above paragraphs 22.1 through 22.4, inclusively, in every subcontract or purchase order so that such provisions will be binding upon such subcontractor or vendor.

This Agreement entered into as of the day and year first written above.

| **OWNER** *(Signature)* | **CONTRACTOR** *(Signature)* |
|---|---|
| ~~« PETER F, MEITZNER, Chairman – Commissioner, First District »~~ | « »« » |
| *(Printed name and title)* | *(Printed name and title)* |

Approved as to Form:

_____
~~Jason M. Janoski~~
Assistant County Counselor

Attest:

_____
Kelly B. Arnold
County Clerk

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# SECTION 01 10 00 - SUMMARY

## PART 1 GENERAL

### 1.01 PROJECT

A. Project Name: Sedgwick County ADF Mech. Replacement
B. Owner's Name: Sedgwick County.
C. The Project consists of the replacement of water heaters and associated items.

### 1.02 DESCRIPTION OF ALTERATIONS WORK

A. Scope of demolition and removal work is indicated on drawings and specified in Section 02 41 00.
B. Plumbing: Alter existing system and add new construction, keeping existing in operation.
C. HVAC: Alter existing system and add new construction, keeping existing in operation.
D. Electrical Power and Lighting: Alter existing system and add new construction, keeping existing in operation.

### 1.03 OWNER OCCUPANCY

A. Owner intends to continue to occupy the building during the entire construction period.
   1. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with the day-to-day operations of the Owner. Maintain existing exits unless otherwise indicated
   2. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
   3. Notify the Owner not less than 72 hours in advance of activities that will affect the operations of the Owner.
B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
C. Schedule the Work to accommodate Owner occupancy.

### 1.04 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.
   1. Do not disturb portions of Project site beyond areas in which the Work is indicated.
B. Arrange use of site and premises to allow:
   1. Owner occupancy.
   2. Work by Others.
C. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Provide temporary exiting pathways where required or as indicated.
   3. Do not obstruct roadways, sidewalks, or other public ways without permit.
D. Existing building spaces may not be used for storage.
E. Utility Outages and Shutdown:
   1. Do not disrupt utility services to the building unless absolutely necessary and fully coordinated with the Owner.

2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
3. Prevent accidental disruption of utility services to other facilities.
4. Do not disrupt or shut down power to LAN/WAN systems without coordination with the Owner. It is the responsibility of the General Contractor to identify these locations with assistance from the Owner prior to starting any Work.

F. Controlled Substances: Use of tobacco products and other controlled substances within the new or existing building or the Project site is not permitted.

**1.05 WORK SEQUENCE**

A. Coordinate construction schedule and operations with Owner.

**1.06 PERMANENT UTILITIES**

A. Owner will pay the direct cost from the utility company for the permanent service for the following:
1. Electric.
2. Gas.
3. Water.
4. Telephone.
5. Cable.
6. Fiber.

B. All other fees and Work shall be included in the cost of Bid.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

# SECTION 01 30 00 - ADMINISTRATIVE REQUIREMENTS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. General administrative requirements.
B. Copyright.
C. AIA Documents.
D. Electronic document submittal service.
E. Preconstruction meeting.
F. Progress meetings.
G. Construction progress schedule.
H. Contractor's daily reports.
I. Progress photographs.
J. Submittals for review, information, and project closeout.
K. Number of copies of submittals.
L. Requests for Interpretation (RFI) procedures.
M. Additional Architectural or Engineering Work.
N. Submittal procedures.

### 1.02 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
B. Make the following types of submittals to Schaefer Architecture:
    1. Requests for Interpretation (RFI).
    2. Requests for substitution.
    3. Shop drawings, product data, and samples.
    4. Test and inspection reports.
    5. Design data.
    6. Manufacturer's instructions and field reports.
    7. Applications for payment and change order requests.
    8. Progress schedules.
    9. Coordination drawings.
    10. Correction Punch List and Final Correction Punch List for Substantial Completion.
    11. Closeout submittals.

### 1.03 COPYRIGHT

A. The Drawings and Project Manual of the Project are copyrighted by Schaefer Architecture and consultants. Said drawings, details and specifications shall NOT be reproduced in any manner by any contractor, sub-contractor, supplier, or manufacturer for the purpose of preparing required submittals unless specifically directed to do so by these documents.

### 1.04 AIA DOCUMENTS

A. Documents of the American Institute of Architects referred to in the specifications can be purchased by the Contractors from:
    1. AIA Kansas, Phone (785) 357-5308 or (800) 444-9853.

B. **Contractors are cautioned that the AIA documents required under this Contract are copyrighted by the AIA.**

## PART 2 PRODUCTS - NOT USED

## PART 3 EXECUTION

### 3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
   1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
      a. Allows for documents to be uploaded.
   2. Contractor and Schaefer Architecture are required to use this service.
   3. It is Contractor's responsibility to submit documents in allowable format.
   4. Subcontractors, suppliers, and Schaefer Architecture's consultants are to be permitted to use the service at no extra charge.
   5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
   6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
   7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
   8. Automatic CD archive once construction is complete.
B. Cost: The cost of the service is to be paid by Contractor; include the cost of the service in the Contract Sum.
C. Submittal Service: Use one of the following:
   1. Submittal Exchange (tel: 1-800-714-0024): www.submittalexchange.com/#sle.
   2. Newforma ConstructEx: www.newforma.com/our-solutions/constructex/#sle.
   3. Procore (tel: 1-866-477-6267): www.procore.com
D. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Schaefer Architecture and Contractor participating; further training is the responsibility of the user of the service.
E. Project Closeout: Schaefer Architecture will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

### 3.02 PRECONSTRUCTION MEETING

A. Schaefer Architecture will schedule a meeting after Notice of Award.
B. Attendance Required:

1. Owner.
2. Schaefer Architecture.
3. General Contractor.
4. Contractor.

C. Agenda:
1. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
2. Designation of personnel representing the parties to Contract, _____ and Schaefer Architecture.
3. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
4. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with an electronic copy in PDF format to Schaefer Architecture, Owner, participants, and those affected by decisions made.

**3.03 PROGRESS MEETINGS**

A. Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:
1. Contractor.
2. Owner.
3. Schaefer Architecture.
4. Contractor's superintendent.
5. Major subcontractors.

D. Agenda:
1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of RFIs log and status of responses.
7. Review of off-site fabrication and delivery schedules.
8. Maintenance of progress schedule.
9. Corrective measures to regain projected schedules.
10. Planned progress during succeeding work period.
11. Coordination of projected progress.
12. Maintenance of quality and work standards.
13. Effect of proposed changes on progress schedule and coordination.
14. Other business relating to work.

E. Record minutes and distribute copies within two days after meeting to participants, with an electronic copy in PDF format to Schaefer Architecture, Owner, participants, and those affected by decisions made.

## 3.04 CONSTRUCTION PROGRESS SCHEDULE

A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.
B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
C. Within 15 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
    1. Include written certification that major contractors have reviewed and accepted proposed schedule.
D. Within 10 days after joint review, submit complete schedule.
E. Submit updated schedule every 30 days.

## 3.05 DAILY CONSTRUCTION REPORTS

A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.
B. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
    1. Date.
    2. High and low temperatures, and general weather conditions.
    3. Safety, environmental, or industrial relations incidents.
    4. Meetings and significant decisions.
    5. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
    6. Testing and/or inspections performed.
    7. Signature of Contractor's authorized representative.

## 3.06 PROGRESS PHOTOGRAPHS

A. Photography Type: Digital; electronic files.
B. Provide photographs of site and construction. Take photographs during construction activities where work will be concealed and throughout progress of Work. Photographs may be used to establish location and arrangement of concealed elements such as plumbing systems. These shall be part of the record documents.
C. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
    1. Delivery Medium: Jump drive.
    2. File Naming: Include project identification, date and time of view, and view identification.

## 3.07 REQUESTS FOR INTERPRETATION (RFI)

A. Definition: A request seeking one of the following:
    1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are

required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
1. Prepare a separate RFI for each specific item.
   a. Do not forward requests which solely require internal coordination between subcontractors.
2. Prepare using software provided by the Electronic Document Submittal Service.
3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
1. Include in each request General Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
2. Unacceptable Uses for RFIs: Do not use RFIs to request the following:
   a. Approval of submittals (use procedures specified elsewhere in this section).
   b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
   c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
   d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response.
4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, the Contract Documents, with no additional input required to clarify the question. They will be returned without a response.

E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.

F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Indicate current status of every RFI. Update log promptly and on a regular basis.
2. Note dates of when each request is made, and when a response is received.

H. Review Time: Schaefer Architecture will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.

1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
   1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
   2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
   3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.

## 3.08 ADDITIONAL ARCHITECTURAL OR ENGINEERING WORK

A. Design has been based upon product and equipment data available at the time the design work was done.

B. Any costs for modifying construction and design for substitutes shall be the responsibility of the party making or requesting the substitute for the designed product even when the substitute product is specified. Such costs shall be paid to the Owner who shall reimburse the architect and/or consultants. The rate charged by Schaefer Architecture is $120 per hour. Consulting Engineers standard rates apply.

## 3.09 SUBMITTAL SCHEDULE

A. Items requiring color selections, including mechanical and electrical devices, will not be made until Contractor submits all data and samples for selecting colors and finishes.

## 3.10 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.

B. Submit to Schaefer Architecture for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.
   1. Physcial sample(s) showing the color and other physical properties is required for selection. Electronic images or PDF's will not be reviewed for sample selection. Printed cards or brochures not containing actual physical color and finish sample(s) will not be accepted.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

## 3.11 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.

2. Certificates.
3. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

B. Submit for Schaefer Architecture's knowledge as contract administrator or for Owner.

## 3.12 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Final Correction Punch List for Substantial Completion.
B. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Other types as indicated.
C. Submit for benefit of the Owner during and after project completion.

## 3.13 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Schaefer Architecture.
   1. Retained samples will not be returned to Contractor unless specifically so stated.

## 3.14 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Use a separate transmittal for each item.
   2. Transmit using approved form.
      a. Use form generated by Electronic Document Submittal Service software.
   3. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
   4. 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 the requirements of the work and Contract Documents.
      a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
   5. Schedule submittals to expedite the Project, and coordinate submission of related items.
      a. For each submittal for review, allow 15 days time to and from the Contractor.
      b. For sequential reviews involving Schaefer Architecture's consultants, Owner, or another affected party, allow an additional 7 days.
   6. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
   7. Provide space for Contractor and Schaefer Architecture review stamps.

8. When revised for resubmission, identify all changes made since previous submission.
9. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
10. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.

B. Product Data Procedures:
1. Submit only information required by individual specification sections.
2. Collect required information into a single submittal.
3. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:
1. Digital Data Files: Electronic copies of CAD drawings or Building Information Model of the Contract Drawings will be provided by Schaefer Architecture, Engineers or Consultants for Contractor's use in preparing submittals as follows.
a. Cost for each CAD sheet is $150.00.
b. Cost for Navisworks model is $300.00.
c. Contractor to sign Electronic Release Form and pay Schaefer Architecture prior to receiving CAD sheet(s) or Navisworks model.
d. Schaefer Architecture makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
2. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
3. Do not reproduce Contract Documents to create shop drawings.
4. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

## 3.15 SUBMITTAL REVIEW

A. Submittals for Review: Schaefer Architecture will review each submittal, and approve, or take other appropriate action.
B. Submittals for Information: Schaefer Architecture will acknowledge receipt and review. See below for actions to be taken.
C. Schaefer Architecture's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.

D. Schaefer Architecture's and consultants' actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
a. "No exception taken", or language with same legal meaning.
b. "Make corrections noted", or language with same legal meaning.
1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
c. "Submit specified item", or language with same legal meaning.
1) Submit correct item, with review notations acknowledged and incorporated. Submit separately, or as part of project record documents.
2. Not Authorizing fabrication, delivery, and installation:

a. "Revise and Resubmit".
1) Resubmit revised item, with review notations acknowledged and incorporated.
b. "Rejected".
1) Submit item complying with requirements of Contract Documents.

E. Schaefer Architecture's and consultants' actions on items submitted for information:
1. Items for which no action was taken:
a. "Received" - to notify the Contractor that the submittal has been received for record only.
2. Items for which action was taken:
3. "Reviewed" - no further action is required from Contractor.

F. Maintain one complete set of submittals at the Project.

**END OF SECTION**

# SECTION 01 40 00 - QUALITY REQUIREMENTS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Submittals.
B. Quality assurance.
C. References and standards.
D. Control of installation.
E. Mock-ups.
F. Tolerances.
G. Defect Assessment.

### 1.02 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Certificates: When specified in individual specification sections, submit certification by the manufacturer and General Contractor or installation/application subcontractor to Schaefer Architecture, in quantities specified for Product Data.
   1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Schaefer Architecture.
C. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

### 1.03 QUALITY ASSURANCE

A. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of General Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in Kansas.

### 1.04 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
   1. If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Schaefer Architecture for a decision before proceeding. Refer instances of uncertainty as to which two levels of quantity or quality is more stringent to Schaefer Architecture for decision.
B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
C. Should specified reference standards conflict with Contract Documents, request clarification from Schaefer Architecture before proceeding.

1. Schaefer Architecture may select the more stringent of the two for the application intended.

D. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Schaefer Architecture shall be altered from Contract Documents by mention or inference otherwise in any reference document.

## PART 2 PRODUCTS - NOT USED

## PART 3 EXECUTION

### 3.01 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. Should manufacturers' instructions conflict with Contract Documents, request clarification from Schaefer Architecture 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. Where drawings and/or specifications designate a standard of performance (e.g., fire rating, sound transmission class, insulation value, heating output, air velocity, etc.) the completed installation shall perform at least to the designated standard.
F. Have work performed by persons qualified to produce required and specified quality.
G. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
H. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

### 3.02 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. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Schaefer Architecture before proceeding.
C. Adjust products to appropriate dimensions; position before securing products in place.

### 3.03 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements at Contractors expense.
B. If, in the opinion of Schaefer Architecture, it is not practical to remove and replace the work, Schaefer Architecture will direct an appropriate remedy or adjust payment.

**END OF SECTION**

# SECTION 01 41 00 - REGULATORY REQUIREMENTS

## PART 1 GENERAL

### 1.01 SUMMARY of Reference Standards

A. Regulatory requirements applicable to this project are the following:
B. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
C. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
D. 29 CFR 1910 - Occupational Safety and Health Standards; Current Edition.
E. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
F. ICC (IFC) - International Fire Code; 2018.
G. ICC (IBC) - International Building Code; 2024.
H. ICC (IBC) - ICC International Existing Building Code, 2024.
I. IAPMO (UPC) - Uniform Plumbing Code; 2021.
J. ICC (IMC) - International Mechanical Code; 2024.
K. ICC (IFGC) - International Fuel Gas Code; 2021.
L. NFPA 70 - National Electrical Code; 2023.
M. ICC (IECC) - International Energy Conservation Code; 2006.
N. Kansas Department of Health and Environment.
O. Applicable State Statutes Annotated (K.S.A.).
P. ASHRAE 90.1 - 2004.
Q. National Fire Protection Association, National Fire Codes.
R. American Welding Society, AWS D1.1-04.
S. Kansas Boiler Safety Act, KSA 44-913, 2006.
T. All other federal, state, county, and local requirements applicable and/or referenced.

### 1.02 QUALITY ASSURANCE

A. General Contractor's Designer Qualifications: Refer to Section - 01 40 00 - Quality Requirements.

### 1.03 BUILDING PLAN REVIEW & PERMIT:

A. The Owner has submitted the Bidding Documents for Code Plan Review and paid the review fee.
B. The Building Permit(s) and all other construction fees shall be included in the cost of the Work being bid.
    1. Development fees charged by the city/county shall be paid for by the Owner.

## PART 2 PRODUCTS - NOT USED

## PART 3 EXECUTION - NOT USED

## END OF SECTION

# SECTION 01 42 16 - DEFINITIONS

## PART 1 GENERAL

### 1.01 SUMMARY

A. This section supplements the definitions contained in the General Conditions.
B. Other definitions are included in individual specification sections.
C. Specifications.
D. Drawings.

### 1.02 DEFINITIONS

A. A great amount of the specification language can be recognized as specific definitions for nominal terms found on the drawings and in other contract documents. Certain terms used more generally throughout the Contract Documents are hereby defined as follows:
B. Directed, Requested, Etc.: Where not otherwise explained, terms such as "directed," "requested," "authorized," "selected," "approved," "required," "accepted" and "permitted" mean "directed by the Architect," "requested by the Architect," etc. However, no such implied meaning will be interpreted to extend the Architect's responsibility into the Contractor's area of construction supervision.
C. Furnish: To supply, deliver, unload, inspect for damage and ready for unpacking, assembly and installation.
D. General Requirements: The terms "General Requirement(s)" and "Division 1 Section(s)" are alike in meaning and significance.
E. Guarantee and Warranty: Defined to be identical in meaning and used interchangeably.
F. Indicated: The term "indicated" is a cross reference to details, notes, or schedules on the drawings, other paragraphs or schedules in the specifications, and similar means of recording requirements in the contract documents. Where terms such as "shown," "noted," "scheduled" and "specified" are used in lieu of "indicated," it is for the purpose of helping the reader accomplish the cross reference, and no limitation of location is intended except as specifically noted.
G. Install, Erect, Construct, and Similar Terms: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use as part of the Work.
H. Installer: The person or entity engaged by the Contractor or his Subcontractor or Sub-subcontractor for the performance of a particular unit of Work at the project site, including installation, erection, application, and similar required operations. It is a general requirement that Installers be recognized experts in the work they are engaged to perform.
I. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.
J. Project Site: The space available to the Contractor for the performance of the Work, either exclusively or in conjunction with others performing other work as part of the Project.
K. Provide: To furnish and install, complete and ready for the intended use.
L. Reviewed: Where used in conjunction with the Architect's or Engineer's response to submittals, requests, applications, inquiries, reports, and claims by the Contractor, the

meaning of the term "reviewed" will be held to the limitations of the Architect's responsibilities and duties as specified in the General and Supplementary Conditions and General Requirements. In no case will "reviewed" by the Architect be interpreted as an assurance to the Contractor that the requirements of the Contract Documents have been fulfilled.

M. Supply: Same as Furnish.

N. Testing Laboratory: An independent entity engaged to perform specific inspections or tests of the work, either at the project site or elsewhere; and to report and (if required) interpret the results of those inspections or tests.

**1.03 PROJECT MANUAL**

A. The Project Manual is the volume(s) which binds together the Bidding Documents, General Conditions as Modified, and Specifications; identified for this Contract. The several parts of the volume(s) are listed in the Table of Contents of the volume(s).

**1.04 SPECIFICATIONS**

A. General: This series of explanations is provided to assist the user of these specifications and associated contract documents to more readily understand the format, language, implied requirements and similar conventions of the content. None of these explanations will be interpreted to modify the substance of the requirements.

B. Format Explanation: The format of the principal portions of specifications can be described as follows - although other portions may not fully comply and no particular significance will be attached to such compliance or noncompliance.

C. Sections: Sections have been subdivided into 3 (or less) "parts" for uniformity and convenience (Part 1 -General, Part 2 - Products, and Part 3 - Execution). These do not imply a particular meaning and are not an integral part of the text which specified requirements.

D. Imperative language is frequently used and, except as otherwise specified, requirements expressed imperatively are to be performed by the Contractor. For clarity of reading, contrasting subjective language is frequently used to describe the responsibilities which must be fulfilled either indirectly by the Contractor or by others.

E. Streamlined style of the specifications results in abbreviated and incomplete sentences. Omission of words or phrases such as "the Contractor shall," "according to the plans," "a," "the," and "all" are intentional. Omitted words or phrases shall be supplied by inference in the same manner as they are when a note occurs on the drawings.

F. Section number is for the purposes of abbreviated identification in connection with cross references. The Sections are placed in the binder(s) in sequence; however, this sequence is not complete and the Table of Contents of the Project Manual must be consulted to determine the total listing of Sections.

G. Pages of each Section are numbered independently for each Section. The Section number is shown with the page number at the bottom of each page. "End of Section" appears on the last page of each Section. Contractor(s) shall verify that all pages of the Specifications are included.

H. Project identification and date of publication, and revision where applicable, of the Contract Documents are recorded on each page to minimize misuse of the specifications and confusion with other project specifications.

I. Mechanical and Electrical Provisions: Certain portions of Mechanical Work and Electrical Work of the General Requirements have been specified in their Divisions. This is for the traditional convenience and clarity of using the Contract Documents, and no other meaning will be interpreted from this arrangement of content, except as otherwise specifically indicated. They in turn reference certain other Divisions and Sections to minimize duplication in specifications and to correlate similar work performed by different parties.
J. Contractors are responsible for their work regardless which Section it is included in.
K. Contractor's Options: Where more than one set of requirements are specified for a particular unit of work. The option is intended to be the Contractor's.
L. Specifications and Drawings Complementary: What is included in one is the same as though included in the other or included in both.
M. Overlapping Requirements and Conflicts: In the event of conflicts between the Contract Documents or between the Contract Documents and applicable standards, codes, resolutions and ordinances, the Contractor shall (1) provide the better quality or greater quantity of Work or (2) comply with the more stringent requirement; or both in accordance with the interpretation of Schaefer Architecture.
N. Abbreviations: The language of the Specifications and elsewhere in the Contract Documents is of the abbreviated type in certain instances, and implies words and meanings which will be appropriately interpreted. Actual word abbreviations of a self-explanatory nature have been included in the text. Trade associations and general standards are frequently abbreviated. Singular words will be interpreted as plural and plural words will be interpreted as singular wherever applicable and the full context of the requirement so indicated.

**1.05 DRAWINGS**

A. Not all conditions have been detailed although such work is a part of the Contract.
B. In lieu of details, some work may require conformance with written instructions, notes, and/or standards. Such work is a part of the Contract.
C. Do not scale drawings for dimensions. Accurately layout such work from dimensions indicated unless such be found in error.
D. Where drawings indicate a portion of the work and the remainder is shown in outline. The parts drawn out apply to other like portions of the work. Where detail is indicated by starting, only, such detail shall continue to apply throughout the courses or parts in which it occurs and apply to similar parts of work unless otherwise indicated.
E. Details indicate the general application of work at all locations where it logically applies. Provide other related work incident thereto to fully complete the work consistent with the detail, other related details, and actual conditions.
F. Consult Architect for interpretations concerning locations of equipment.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

# SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Temporary telecommunications services.
B. Temporary sanitary facilities.
C. Temporary Controls: Barriers, enclosures, and fencing.
D. Hoisting Facilities.
E. Fire Protection.
F. Security requirements.
G. Vehicular access and parking.
H. Waste removal facilities and services.
I. Moisture and Mold Control.

### 1.02 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

### 1.03 TEMPORARY UTILITIES - See Section 01 51 00

### 1.04 TELECOMMUNICATIONS SERVICES

A. General Contractor shall provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
B. Superintendent for General Contractor shall be available by cell phone throughout the day.
C. Long distance calls shall be paid for by party making call.

### 1.05 TEMPORARY SANITARY FACILITIES

A. General Contractor to provide and maintain required temporary facilities and enclosures. Provide at time of project mobilization.
   1. Temporary toilet facilities shall meet the requirements of the state and local departments of public health.
B. Use of existing facilities is not permitted.
C. New permanent facilities may not be used during construction operations.
D. Maintain daily in clean and sanitary condition.

### 1.06 BARRIERS

A. General Contractor to provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
C. Provide protection for plants designated to remain. Replace damaged plants.
   1. Care, pruning and maintenance of trees which are to remain shall be done under the direction of and in accordance with recommendations of a qualified and approved arborist or tree trimming specialist.
D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

## 1.07 FENCING

A. Construction: Commercial grade chain link fence. A panelized system may be utilized.
B. Provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.
   1. Extent of Fence: As required to enclose portion determined sufficient to accomodate construction operations.

## 1.08 EXTERIOR ENCLOSURES

A. Provide temporary 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.

## 1.09 INTERIOR ENCLOSURES

A. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.
B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces unless indicated or required otherwise:
   1. Maximum flame spread rating of 75 in accordance with ASTM E84.

## 1.10 HOISTING FACILITIES

A. For two stories (including roof) or less above grade; each contractor and subcontractor shall be responsible for providing their own hoisting of their own materials and debris.
B. Elevator Use: Use of elevator(s) is not permitted.
C. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
   1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

## 1.11 FIRE PROTECTION

A. General Contractor shall provide temporary fire protection. Portable fire extinguishers shall be provided with class and extinguishing agent as required by locations and classes of fire exposures. Subcontractors will be responsible for their own specialty requirements. Permanent fire protection equipment used for fire protection during construction shall be the responsibility of the installing contractor.

## 1.12 SECURITY

A. Provide security and facilities to protect Work, and Owner's operations from unauthorized entry, vandalism, or theft.
B. General Contractor may provide a "watchman" at their own cost.

## 1.13 VEHICULAR ACCESS AND PARKING

A. General Contractor shall provide adequate access including roads into the site of the structure, if required, for the prosecution of the work. Also provide and maintain at least

one temporary or permanent access to each working elevation which is to be permanently occupied

B. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
C. Coordinate access and haul routes with governing authorities and Owner.
D. Provide and maintain access to fire hydrants, free of obstructions.
E. Provide means of removing mud from vehicle wheels before entering streets.
   1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
F. Existing on-site roads may be used for construction traffic.
G. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

## 1.14 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
B. Provide containers with lids. Remove trash from site periodically.
C. Each Contractor or Subcontractor shall be responsible to collect and deposit their debris in such collection facilities. The General Contractor shall be responsible for the removal of all debris from the job site.
D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.
F. Trash that blows onto adjacent property shall be removed by the responsible party or parties under the direct supervision of the General Contractor.
G. Subcontractors shall collect and remove their own liquid waste and properly dispose of off-site.

## 1.15 MOISTURE AND MOLD CONTROL

A. Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
B. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
   1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
   2. Keep interior spaces reasonably clean and protected from water damage.
   3. Periodically collect and remove waste containing cellulose or other organic matter.
   4. Discard or replace water-damaged material.
   5. Do not install material that is wet.
   6. Discard, replace or clean stored or installed material that begins to grow mold.
   7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

C. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
   1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
   2. Use permanent HVAC system when they come available to control humidity.
   3. Comply with manufacturer's written instructions on products for temperature, relative humidity, and exposure to water limits.

**1.16 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS**

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
B. Remove underground installations to a minimum depth of 2 feet (600 mm). Grade site as indicated.
C. Clean and repair damage caused by installation or use of temporary work.
D. Restore existing facilities used during construction to original condition.
E. Restore new permanent facilities used during construction to specified condition.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

# SECTION 01 51 00 - TEMPORARY UTILITIES

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Temporary Utilities: Provision of electricity, lighting, heat, ventilation, and water.

### 1.02 TEMPORARY ELECTRICITY

A. Cost: By Owner.
B. Connect to Owner's existing power service.
   1. Do not disrupt Owner's need for continuous service.
   2. Exercise measures to conserve energy.
C. Provide temporary electric feeder from existing building electrical service at location as directed.
D. Power Service Characteristics: 120/208 or 120/240 volt, required ampere, three phase, four wire.
   1. Each Contractor shall be responsible for power they require exceeding systems specified.
E. Complement existing power service capacity and characteristics as required.
F. Electrical Contractor shall provide power outlets for construction operations, with branch wiring and distribution boxes located as required so that an extension no longer than 100 feet (30 m) will reach any work station. Each Contractor shall provide their own flexible power cords as required.
   1. Provide sufficient capacity for construction tools, equipment, temporary ventilation and lighting.
   2. Modify, maintain and upon completion of project remove temporary power system.
G. Employ permanent systems as they are completed and available.
H. Permanent convenience receptacles may be utilized during construction.

### 1.03 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain LED, compact fluorescent, or high-intensity discharge lighting as suitable for the application for construction operations in accordance with requirements of 29 CFR 1926 and authorities having jurisdiction.
   1. Each Contractor shall be responsible for lighting they require exceeding systems specified.
B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
C. Maintain lighting and provide routine repairs.
   1. Upon completion of project or when permanent system are deployed remove temporary lighting system.
D. Permanent building lighting may be utilized during construction.

### 1.04 TEMPORARY HEATING

A. Cost of Energy: By Owner.
B. Provide heating devices and heat as needed to maintain specified conditions for construction operations.
   1. Subcontractors having additional specific or unusual requirements shall be responsible for their own requirements.

C. Maintain minimum ambient temperature of 50 degrees F (10 degrees C) in areas where construction is in progress, unless indicated otherwise in specifications.
D. Owner's existing heat plant may be used.
   1. Exercise measures to conserve energy.
E. Mechanical and Electrical Contractors shall cooperate with General Contractor in making permanent system(s) available as soon as possible.
F. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.
   1. Warranties shall not begin on equipment until the date of substantial completion. General Contractor shall purchase extended warranties as required.

**1.05 TEMPORARY COOLING**

A. Cost of Energy: By Owner.
B. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.
   1. Subcontractors having additional specific or unusual requirements shall be responsible for their own requirements.
C. Owner's existing cooling plant may be used.
   1. Exercise measures to conserve energy.

**1.06 TEMPORARY VENTILATION**

A. Existing ventilation equipment may not be used.

**1.07 TEMPORARY WATER SERVICE**

A. Cost of Water Used: By Owner.
B. Plumbing Contractor shall provide and maintain suitable quality water service for construction operations at time of project mobilization.
C. Extend branch piping with outlets located so water is available by hoses with threaded connections.
   1. Provide at least one hose bibb in each floor level.
   2. Each contractor shall provide their own water hose.
   3. Each Contractor shall be responsible for water they require exceeding systems specified.
D. General Contractor shall provide potable drinking water in convenient and accessible locations, for all persons engaged upon the work, so long as they have personnel on the job.
E. Employ permanent systems when available and remove temporary service when no longer needed.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

# SECTION 01 60 00 - PRODUCT REQUIREMENTS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. General product requirements.
B. Re-use of existing products.
C. Transportation, handling, storage and protection.
D. Product option requirements.
E. Substitution limitations.
F. Maintenance materials, including extra materials, spare parts, tools, and software.

## PART 2 PRODUCTS

### 2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the General Contractor; remove from site.
    1. The Owner has first salvage rights on materials and equipment whether identified to remain as property of the Owner or not.

### 2.02 NEW PRODUCTS

A. Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
B. Use of products having any of the following characteristics is not permitted:
    1. Containing lead, cadmium, or asbestos.

### 2.03 PRODUCT OPTIONS

A. General: The specifying of particular products, materials and systems is done to establish a minimum standard of performance, quality, type and physical characteristics.
B. Prebid approval is required for proposed materials, equipment or systems for manufacturers not specified or listed in the Contract Documents when other manufacturers and/or products are specified and there is listed a Provision for Substitutions.
C. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
D. Products where it is specified by name, model number or series to establish quality with a Provision for Substitutions: Use product indicated. Submit a request for substitution for any product not named.
E. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
F. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

G. Products Specified as Basis-of-Design: Submit substitution requests for unnamed products to Schaefer Architecture for evaluation.
H. Where Contractor proposes products or systems as a "Bidders Alternate", a request for substitution is not required. Follow requirements under section 01 23 00 - Alternates.

**2.04 PRODUCT OPTIONS AFTER BID**

A. After execution of contract, substitutions of materials, equipment or systems other than those specified and approved by addendum will be approved by the Schaefer Architecture only if the following are met:
   1. Materials specified and ordered in a timely manner cannot be delivered to the job in time to complete the work in proper sequence.
   2. An equal or superior material is proposed.
   3. The Project cost will lower or remain unchanged.

**2.05 MAINTENANCE MATERIALS**

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
B. Deliver and place in location as directed; obtain receipt prior to final payment.

**PART 3 EXECUTION**

**3.01 TRANSPORTATION AND HANDLING**

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
D. Transport and handle products in accordance with manufacturer's instructions.
E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

**3.02 STORAGE AND PROTECTION**

A. Provide protection of stored materials and products against theft, casualty, or deterioration.
B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
   1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.
C. Store and protect products in accordance with manufacturers' instructions.
D. Store with seals and labels intact and legible.

E. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
F. For exterior storage of fabricated products, place on sloped supports above ground.
G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
H. Comply with manufacturer's warranty conditions, if any.
I. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
J. Prevent contact with material that may cause corrosion, discoloration, or staining.
K. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
L. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

**END OF SECTION**

# SECTION 01 70 00 - EXECUTION AND CLOSEOUT REQUIREMENTS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.
B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
C. Pre-installation meetings.
D. Cutting and patching.
E. Cleaning and protection.
F. Starting of systems and equipment.
G. Demonstration and instruction of Owner personnel.
H. Closeout procedures, including General Contractor's Correction Punch List, except payment procedures.
I. General requirements for maintenance service.

### 1.02 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
    1. Structural integrity of any element of Project.
    2. Efficiency, maintenance, or safety of any operational element.
    3. Visual qualities of sight exposed elements.
    4. Work of Owner or separate Contractor.
    5. Include in request:
        a. Location and description of affected work.
        b. Necessity for cutting or alteration.
        c. Description of proposed work and products to be used.
        d. Date and time work will be executed.
C. Project Record Documents: Accurately record actual locations of capped and active utilities.

### 1.03 QUALIFICATIONS

A. For demolition work, employ a firm specializing in the type of work required.

### 1.04 PROJECT CONDITIONS

A. Use of explosives is not permitted.
B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
    1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.

2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.

F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Minimize amount of bare soil exposed at one time.
   2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
   3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
   4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

G. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

H. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

I. Pollution Control: 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. Comply with federal, state, and local regulations.

## 1.05 COORDINATION

A. See Section 01 10 00 for occupancy-related requirements.

B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

C. Notify affected utility companies and comply with their requirements.

D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated 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.

F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

G. Coordinate completion and clean-up of work of separate sections.

H. 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.

# PART 2 PRODUCTS

## 2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
B. Verify that 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. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

### 3.02 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 any new material or substance in contact or bond.

### 3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
B. Require attendance of parties directly affecting, or affected by, work of the specific section.
C. Notify Schaefer Architecture four days in advance of meeting date.
D. Prepare agenda and preside at meeting:
    1. Review conditions of examination, preparation and installation procedures.
    2. Review coordination with related work.
E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Schaefer Architecture, Owner, participants, and those affected by decisions made.

### 3.04 ORDERING, RECEIVING, AND STORING MATERIALS

A. Order materials in timely manner to assure delivery in ample time for orderly incorporation into the Work.
B. On receipt of materials, check for in-transit damage in ample time to replace any damaged materials prior to installation time.
C. Wherever possible deliver materials and equipment to project site in manufacturer's original packages, keeping labels intact until final cleaning. Where items are to be job-

assembled, label, tag, mark or otherwise properly identify each component part until incorporated in the Work.

D. Store materials in a manner to prevent deterioration, staining, soiling and intrusion of foreign materials. Provide waterproof well-ventilated enclosures for materials subject to deterioration by dampness. Adequately protect those materials subject to damage by freezing and frost.
E. Remove from premises and replace with new, any materials showing deterioration or damage.

**3.05 MANUFACTURER'S REQUIREMENT:**

A. All materials and equipment supplied for this building shall be installed, applied or erected in strict accordance with the manufacturer's recommendations or with manufacturer's trade association requirements unless the specifications bound herewith exceed those requirements.
   1. Exception: Methods or procedures, set forth in the manufacturer's recommendations which the Contractor finds unacceptable shall be submitted to Schaefer Architecture in writing for clarification.

**3.06 GENERAL INSTALLATION REQUIREMENTS**

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
E. Make neat transitions between different surfaces, maintaining texture and appearance.
F. Prepare all work to receive subsequent work or finish as needed and described in specifications for both substrate and subsequent products.
G. Furnish, apply, install, connect, erect, clean and condition manufactured articles, materials, and equipment per manufacturer's printed directions. If otherwise indicated or specified, notify Schaefer Architecture well in advance of installation and prerequisite construction.
H. Manufacturer's printed directions must be on job prior to and during installation of materials and equipment.
I. Provide all attachment devices and materials necessary to secure materials together or to other materials and to secure work of other trades.
J. Make allowance for ample expansion and contraction for all building components subject to same.
K. Each trade shall build in openings required for their own work and sleeves furnished by another trade for their work and prepare openings when another trade requires and furnishes the information in a timely manner. Each trade shall be responsible for cutting into construction when they have not acted in timely manner; all in accordance with CUTTING AND PATCHING in this section. Each trade shall be responsible for filling around their work, within blockouts, sleeves, and holes for their work, to maintain the integrity (acoustic, fire, smoke, appearance, etc.) of the construction.

L. Where proper fit of work depends upon close tolerances of manufactured products, furnish manufacturer with necessary templates to insure proper fit of all components.
M. Install materials only when conditions of adjacent building components are conducive to achieving best installation results.
N. Construct job assemblies accurately and as necessary for other trades having adjunct work. Correct errors in cutting, shop fabrication and installation. Where necessary to cut into other building components, do so only in a manner not to damage building structurally nor aesthetically, then repair adjoining parts and materials thoroughly and neatly.
O. Erect, install and secure building components in a structurally sound and appropriate manner. Where necessary, temporarily brace, shore, or otherwise support members until final connection or installation. Brace walls and other structural elements to prevent damage by wind and construction operations. Leave temporary bracing, shoring, or other structural supports in place as long as necessary for safety and until structure is strong enough to withstand all loads involved.
P. Where construction consists of a series of courses or units, assemble units in best acceptable manner to provide structurally sound installation, waterproof where exposed to exterior. Accurately plumb and level all courses and verify levels of frequent courses with instrument.
Q. Handle materials in manner to prevent scratching, abrading, distortion, chipping, breaking or other disfigurement to those materials as well as to materials and construction already existing.
R. Unless indicated, fabricate and install materials true to line, plumb and level. Leave finished surfaces smooth and flat or of smooth contour where indicated, free from wrinkles, warps, scratches, dents, and other imperfections
S. Provide quality of workmanship not less than the commercially accepted standards of that trade.
T. Where obviously of best practice, furnish materials in longest practical lengths and largest practical sizes to avoid unnecessary jointing. Make all joints secure.
U. Consult Schaefer Architecture for mounting height or position of any unit not specifically located.
V. Mix no more materials than can be used before materials begin to "set". Mix no partially "set" batch with another. Clean tools and appliances prior to mixing materials that can be contaminated.
W. Conduct work in a manner to avoid injury to previously placed work.
X. Do not disturb materials requiring curing time until appropriate curing time has transpired.
Y. Install, connect, service, and operate permanent systems at earliest practical dates, except as may be modified by specification section 01 51 00.

## 3.07 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
    1. Verify that construction and utility arrangements are as indicated.
    2. Report discrepancies to Schaefer Architecture before disturbing existing installation.
    3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 50 00 in locations indicated on drawings.
C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
   2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.
D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Relocate items indicated on drawings.
   3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, Telecommunications, and LAN/WAN/Data Systems): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. Provide temporary connections as required to maintain existing systems in service.
   4. Verify that abandoned services serve only abandoned facilities.
   5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings as indicated; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
F. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Schaefer Architecture.
2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
3. Where a change of plane of 1/4 inch (6 mm) or more occurs in existing work, submit recommendation for providing a smooth transition for Schaefer Architecture review and request instructions.
4. Trim existing wood doors as necessary to clear new floor finish. Refinish trim as required.

H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

I. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

J. Clean existing systems and equipment.

K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

L. Do not begin new construction in alterations areas before demolition is complete.

M. Comply with all other applicable requirements of this section.

## 3.08 CUTTING AND PATCHING

A. **Prior approval for cutting and patching is required unless waived by the Schaefer Architecture.**

B. **Approval of Schaefer Architecture to proceed with proposed cutting-and-patching does not waive right to later require complete removal and replacement of work found to be cut-and-patched in an unsatisfactory manner.**

C. General:
1. "Cutting-and-patching" is hereby defined to include, but is not necessarily limited to; the cutting and patching of nominally completed and existing work, in order to accommodate the coordination of work, or the installation of other work, or to uncover other work for access or inspection, or to obtain samples for testing, or for repair or correction, or for similar purposes.
2. Patching also is defined as repair to new or existing landscaping or other features.
3. Existing work shall be prepared, cleaned, and patched as required for new work by appropriate trades, ready for the subsequent finishes.
4. Excavating and the associated operations of boulder removal, dewatering, bracing, removal of underground debris, penetration of rock and other barriers, backfilling, and similar work as specified in Division 31 and in other contract documents, may be required as a special form of cutting-and-patching, but is recognized primarily as an example of a related-but-separate category of work.

5. Restoring or removing and replacing non-complying work may require cutting-and-patching operations as specified herein.
6. Refer to other sections of these specifications and all drawings for ramifications regarding work necessary to accomplish installation of items shown.
7. Each trade shall be responsible for the sizing, location, timing, coordinating and cost for cutting and patching necessary to accommodate their work. Cutting and patching shall be done by individuals skilled in working the tools and materials involved.

D. Quality Assurance:
1. Requirements for Structural Work: Do not cut-and-patch structural work in a manner resulting in a reduction of load-carrying capacity or load/deflection ratio.
2. Operational and Safety Limitations: Do not cut-and-patch operational elements and safety-related components in a manner resulting in a reduction of capacities to perform in the manner intended or resulting in decreased operational life, increased maintenance, or decreased safety. Operational elements include but are not limited to the following:
   a. Primary operational systems and equipment.
   b. Fire separation assemblies.
   c. Air or smoke barriers.
   d. Fire-suppression systems.
   e. Mechanical systems piping and ducts.
   f. Control systems.
   g. Fire alarm and Communication systems.
   h. Conveying systems.
   i. Electrical wiring systems.
   j. Operating systems of special construction.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
   a. Water, moisture, or vapor barriers.
   b. Membranes and flashings.
   c. Exterior curtain-wall construction.
   d. Equipment supports.
   e. Piping, ductwork, vessels, and equipment.
   f. Noise- and vibration-control elements and systems.
4. Visual Requirements: Do not cut-and-patch work which is exposed on the exterior or exposed in occupied spaces of the building, in a manner resulting in a reduction of visual qualities or resulting in substantial evidence of the cut-and-patch work, both as judged solely by the Architect. Remove and replace work judged by the Architect to be cut-and-patched in a visually unsatisfactory manner. Trade requiring cutting may use small escutcheons or similar trim at piping, ducts and the like, if permitted for new work, and not as a device to cover work which should be patched.
5. Engage the original Installer/Fabricator to perform cutting-and-patching in new construction. Engage capable personnel to perform cut-and-patch work.

E. Submittals:
   1. Unless waived by Schaefer Architecture, submit proposal well in advance of time work will be performed and request approval to proceed. Include description of why cutting-and-patching cannot (reasonably) be avoided, how it will be performed, products to be used, firms and tradesmen to perform the work, approximate dates of the work, and anticipated results in terms of variations from the work as originally completed.
   2. Schaefer Architecture may require that the Contractor provide structural engineering services through the project structural engineer at the Contractor's expense.
   3. Where applicable, include cost proposal, suggested alternatives to the cutting-and-patching procedure proposed
F. Materials: Provide materials for cutting-and-patching which will result in equal-or-better work than the work being cut-and-patched, in terms of performance characteristics and including visual effect where applicable. Comply with the requirements, and use materials identical with the original materials where feasible and where recognized that satisfactory results can be produced thereby.
G. Whenever possible, execute the work by methods that avoid cutting or patching.
H. See Alterations article above for additional requirements.
I. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-complying work.
J. Protection: Construct barriers to separate work areas from occupied areas and to protect building occupants from danger of uncontrolled temperature and pollution. Seal openings as needed to provide such protection.
   1. Ventilate areas where dust and odors are produced to the outside.
   2. Provide and maintain filters over building ventilating and return air outlets enveloped by dust enclosures when system ties into occupied areas.
K. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
L. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
   1. Minimize the use of hammering and chopping tools.
M. Restore work with new products in accordance with requirements of Contract Documents.
N. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
O. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of the penetrated element.

P. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance unless otherwise indicated.
   3. Ceilings: Patch, repair, or rehang in-place ceilings as necessary or as indicated to provide an even-plane surface of uniform appearance.
   4. Match color, texture, and appearance.
   5. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.
   6. Restore exposed finishes of patched areas, and where necessary, extend finish restoration and new finish onto adjoining retained work, in a manner which will eliminate evidence of patching. As an example; where patch occurs in or adjacent to a painted surface, extend final paint coat over the entire unbroken surface containing the patch after patched area has received prime and base coats and whole surface prepared for painting.

## 3.09 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
   1. Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
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 trash/rubbish from site periodically and dispose off-site; do not burn or bury.

## 3.10 PROTECTION OF INSTALLED WORK

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

H. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.
I. Remove ice and snow as necessary for safety and proper execution of Work.
J. Brace all construction to prevent damage from wind and construction loading.
K. Transport, handle, store and erect materials in a manner to keep them free from injury.
L. Repair damaged materials, systems, equipment and the like. If satisfactory repair cannot be attained, replace damaged products with equally aesthetic and serviceable products, systems and equipment.
M. Clean off any foreign materials accidentally deposited on finish surfaces and, where such would stain, corrode or otherwise disfigure, clean same immediately with material that will not damage finished work.

## 3.11 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.
B. Notify Schaefer Architecture and Owner seven days prior to start-up of each item.
C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
E. Verify that wiring and support components for equipment are complete and tested.
F. Execute start-up under supervision of applicable General Contractor personnel and manufacturer's representative 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 that equipment or system has been properly installed and is functioning correctly.

## 3.12 DEMONSTRATION AND INSTRUCTION

A. See Section 01 79 00 - Demonstration and Training.

## 3.13 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.
B. Adjust windows, doors, drawers, hardware, appliances, motors, valves, controls, and other equipment for proper operation.
C. Seal exterior joints between materials to form a weathertight enclosure.
D. Touch up imperfections in surfaces, paint, and other finishes after all Contractors and tradesmen have completed their work.
E. Completed work shall be thoroughly clean and free from foreign materials and stains.
F. Clean surfaces using appropriate materials and methods that will thoroughly clean but not damage materials and their finishes, not damage or adversely affect other materials in the project.

## 3.14 FINAL CLEANING

A. Execute final cleaning prior to Substantial Completion.

1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
2. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

B. Use cleaning materials that are nonhazardous.
C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
F. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances
G. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
H. Replace filters of operating equipment.
I. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.
J. Clean site; sweep paved areas, rake clean landscaped surfaces.
K. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

## 3.15 CLOSEOUT PROCEDURES

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following:
   1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
   2. Advise Owner of pending insurance changeover requirements.
   3. Advise Owner of pending utility changeover requirements if applicable.
   4. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
   5. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
   6. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
   7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
   8. Complete final cleaning requirements, including touchup painting.
   9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
B. Make submittals that are required by governing or other authorities.
   1. Provide copies to Schaefer Architecture.
C. Notify Schaefer Architecture when work is considered ready for Schaefer Architecture's Substantial Completion inspection.

D. Submit written certification containing General Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete (by General Contractor and Subcontractors) in accordance with Contract Documents and ready for Schaefer Architecture's Substantial Completion inspection.
   1. Separate inspections for mechanical, electrical and general construction work and equipment shall be arranged in the same basic time period by Schaefer Architecture, engineers and consultants.
   2. Schaefer Architecture may decline to perform the inspection if the building (or designated portion) can not be used for the intended purpose.
   3. Schaefer Architecture may also terminate the inspection at any time if the amount and/or type of incomplete work demonstrates that the building can not be used for the intended purpose without generating an inspection report.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Schaefer Architecture's and General Contractor's comprehensive list of items identified to be completed or corrected and submit to Schaefer Architecture.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

G. Notify Schaefer Architecture when work is considered finally complete and ready for Schaefer Architecture's Substantial Completion final inspection.

H. Complete items of work determined by Schaefer Architecture listed in executed Certificate of Substantial Completion.

I. All additional inspections incurred by Schaefer Architecture and/or consultants because of incomplete or unsatisfactory work will be charged to the General Contractor. Time will be billed through the Owner at $100.00 per worker hour for time chargeable to the Project whether on site, traveling, or in office. Payments to be deducted from amounts owed to the General Contractor by the Owner without any additional action required by the Owner, Schaefer Architecture, or General Contractor.

**3.16 MAINTENANCE**

A. Provide service and maintenance of components indicated in specification sections.

**END OF SECTION**

# SECTION 01 78 00 - CLOSEOUT SUBMITTALS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Project record documents.
B. Operation and maintenance data.
C. Warranties.

### 1.02 SUBMITTALS

A. Project Record Documents: Submit documents to Schaefer Architecture with claim for final Application for Payment.
B. Operation and Maintenance Data:
   1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance. Submit two copies.
C. Warranties:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 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 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.
D. Consent of Surety to Final Payment, on AIA Form G707. Submit one electronic copy.
E. Contractor's Affidavit of Payment of Debts and Claims, AIA Document G706. Submit one electronic copy.
F. Contractor's Affidavit of Release of Liens, AIA Document G706A. Submit one electronic copy.
G. Contractor's Release or Waiver of Liens, conditional upon receipt of payment, on the Contractor's letterhead. Submit one electronic copy.
   1. The Owner reserves the right to require any other data necessary to establish satisfactory payment of all contractual obligations.
H. Sales Tax Exemption Certificate. Submit one electronic copy.
I. If required by Owner or Schaefer Architecture, one copy each of all invoices properly identified with the Sales Tax Exemption number as required by the State of Kansas. The Contractor shall retain such invoices for a period of not less than five years.
J. For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence and records established in conjunction with compliance with standards and regulations bearing upon performance of the work.

## PART 2 PRODUCTS - NOT USED

## PART 3 EXECUTION

### 3.01 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.

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 horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   2. Field changes of dimension and detail.
   3. Details not on original Contract drawings.

### 3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

### 3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

B. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

C. Additional information as specified in individual product specification sections.

D. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

## 3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. 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 any special operating instructions.

D. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

E. Provide servicing and lubrication schedule, and list of lubricants required.

F. Include manufacturer's printed operation and maintenance instructions.

G. Include sequence of operation by controls manufacturer.

H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

I. Include test and balancing reports.

J. Additional Requirements: As specified in individual product specification sections.

## 3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabs dividing each system.

C. Submit operations and maintenance manuals in a PDF electronic file.

D. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Schaefer Architecture, Consultants, General Contractor and subcontractors, with names of responsible parties.

E. Tables of Contents: List every item by a bookmark that allows for easy access of content.

F. Arrangement of Contents: Organize as follows:
   1. Project Directory.
   2. Table of Contents.
   3. Operation and Maintenance Data: Arranged by system, then by product category.
      a. Source data.
      b. Product data, shop drawings, and other submittals.
      c. Operation and maintenance data.
      d. Field quality control data.
      e. Photocopies of warranties and bonds.

4. Design Data: To allow for addition of design data furnished by Schaefer Architecture or others, provide a bookmark "Design Data".

## 3.06 WARRANTIES

A. For all pieces of operating equipment and system provided by any trade for this Project and when warranties or guarantees are otherwise specified, submit written guarantee or warranty documents which shall include the following information:
   1. Name and address of Project and Owner.
   2. Article, material or system covered.
   3. Name and address of Installing contractor.
   4. Name and address of Prime Contractor.
   5. Signature of individual authorized to sign contracts for the company issuing the guarantee.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
   1. Scan warranties and assemble complete warranty submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide table of contents at beginning of document.

D. The following terms (minimum) shall be incorporated:
   1. Duration, one year or as specified, dated from "Date of Substantial Completion." This shall be in addition to and not a limitation of other rights the Owner may have under the Contract Documents.
   2. The article, material or system is free from defective materials and workmanship.
   3. Costs of repair or replacement shall not accrue to the Owner including repair or replacement of other work disturbed by repair or replacement.

E. Guarantees which are standard guarantees provided by a manufacturer for his product shall be received by the Contractor, filled out and filed with the company for the Owner. Certificates or registration stubs shall be included with the shop drawings submitted for the Owner upon completion of the work. The Contractor's responsibility stipulated in the paragraph before this one, terminates as stipulated therein. The Owner shall administrate manufacturer's warranties/guarantees thereafter.

F. Co-execute submittals when required.

**END OF SECTION**

# SECTION 01 79 00 - DEMONSTRATION AND TRAINING

## PART 1 GENERAL

### 1.01 SUMMARY

A. Demonstration of products and systems where indicated in specific specification sections.
B. Training of Owner personnel in operation and maintenance is required for:
   1. All software-operated systems.
   2. HVAC systems and equipment.
   3. Plumbing equipment.
   4. Electrical systems and equipment.
   5. Items specified in individual product Sections.

### 1.02 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Training Reports:
   1. Identification of each training session, date, time, and duration.
   2. Sign-in sheet showing names and job titles of attendees.

### 1.03 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
   1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
   2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

## PART 2 PRODUCTS - NOT USED

## PART 3 EXECUTION

### 3.01 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.
B. Demonstration may be combined with Owner personnel training if applicable.
C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.

### 3.02 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.
B. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by

Owner failure to conduct sessions according to schedule will be cause for Owner to charge General Contractor for personnel "show-up" time.

1. Installing subcontractor/supplier, Schaefer Architecture, Engineer/Consultant shall be invited.

C. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.
D. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.
   5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
   6. Discuss common troubleshooting problems and solutions.
   7. Discuss any peculiarities of equipment installation or operation.
   8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
   9. Review recommended tools and spare parts inventory suggestions of manufacturers.
   10. Review spare parts and tools required to be furnished by General Contractor.
   11. Review spare parts suppliers and sources and procurement procedures.
E. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

**END OF SECTION**

# SECTION 02 41 00 - DEMOLITION

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Selective demolition of building elements for alteration purposes.
B. Abandonment and removal of existing utilities and utility structures.

### 1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on General Contractor's use of site and premises.
B. Section 01 10 00 - Summary: Sequencing and staging requirements.
C. Section 01 10 00 - Summary: Description of items to be removed by Owner.
D. Section 01 10 00 - Summary: Description of items to be salvaged or removed for re-use by General Contractor.
E. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
F. Section 01 57 13 - Temporary Erosion and Sediment Control.
G. Section 01 60 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.
H. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
I. Section 02 84 00 - Polychlorinate Biphenyl (PCB) Remediation: Removal of equipment containing substances regulated under the Federal Toxic Substances Control Act (TSCA), including but not limited to PCB- and mercury-containing equipment.

### 1.03 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.
B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

### 1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Site Plan: Showing:
   1. Areas for temporary construction and field offices.
   2. Areas for temporary and permanent placement of removed materials.
C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

### 1.05 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.
   1. Minimum of three years of documented experience.

## PART 2 PRODUCTS -- NOT USED

## PART 3 EXECUTION

### 3.01 SCOPE

A. Remove portions of existing buildings
B. Remove other items indicated, for salvage and relocation.

## 3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with other requirements specified in Section 01 70 00.
B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
    1. Obtain required permits.
    2. Use of explosives is not permitted.
    3. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
        a. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.
        b. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
        c. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.
    4. Provide, erect, and maintain temporary barriers and security devices.
    5. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
    6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
    7. Do not close or obstruct roadways or sidewalks without permit.
    8. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
    9. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
C. Do not begin removal until receipt of notification to proceed from Owner.
D. Do not begin removal until built elements to be salvaged or relocated have been removed.
E. Do not begin removal until vegetation to be relocated has been removed and specified measures have been taken to protect vegetation to remain.
F. Protect existing structures and other elements that are not to be removed.
    1. Provide bracing and shoring.
    2. Prevent movement or settlement of adjacent structures.
    3. Stop work immediately if adjacent structures appear to be in danger.
G. Promptly repair damages caused to adjacent facilities by demolition work.
H. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
I. If hazardous materials are discovered during removal operations, stop work and notify Schaefer Architecture and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.
J. Perform demolition in a manner that maximizes salvage and recycling of materials.
    1. Dismantle existing construction and separate materials.

2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

K. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

L. Refrigerant: Remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction before starting demolition.

## 3.03 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Unused underground piping may be abandoned in place provided it is completely drained and capped; remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

## 3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.

1. Verify that construction and utility arrangements are as indicated.
2. Report discrepancies to Schaefer Architecture before disturbing existing installation.
3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Demolition work for remodeling and replacement of work within existing remaining building shall be done by subcontractors and trades who shall be responsible for removing equipment and materials from the building. Except for Owner's salvage, items removed shall become the property of General Contractor. Refer Section 01 10 00, who shall also be responsible for disposing of it as waste or salvage. Owner has first salvage rights.

C. Demolition work is not specified in detail. Much of the work will be implied by indications on the drawings. For example, removing of a wall may involve removal and patching of the surface preparatory for new finish; piping being removed to at least behind the wall surface; removal of systems extending into areas not being demolished but systems will become inoperative. Complete removal of such systems may not be required except to avoid conflict with other work and finished appearance; removal of doors will involve removing of anchorage, furring, grounds, etc.

D. Work is shown and called out to be "removed." When the word "removed" is used without any modifiers, it shall mean that it and any associate items built with or into it shall be disconnected, removed, services terminated, or treated as otherwise noted.

E. Where "removed" is modified those instructions shall be followed. Remaining construction shall be patched and finished equivalent to other similar and remaining work.
F. Asbestos reports for the buildings are available for review.
G. Separate areas in which demolition is being conducted from other areas that are still occupied.
    1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 50 00 .
H. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
    1. Provide adequate dams and protection to prevent rain water from entering into the existing building.
I. Remove existing work as indicated and as required to accomplish new work.
    1. Remove items indicated on drawings.
    2. Stock pile removed items such as existing ceiling tile, glazed tile block and trim which is removed as part of the demolition work to be used as patch materials to match surrounding surfaces where areas are indicated to be patched or filled.
J. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
    1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
    2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
    3. See Section 01 10 00 for other limitations on outages and required notifications.
    4. Verify that abandoned services serve only abandoned facilities before removal.
    5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings or in tunnels where indicated; remove back to source of supply where possible, otherwise cap stub and tag with identification.
K. Protect existing work to remain.
    1. Prevent movement of structure; provide shoring and bracing if necessary.
    2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
        a. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces.
        b. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
    3. Repair adjacent construction and finishes damaged during removal work.
    4. Patch as specified for patching new work.
L. Moveable Equipment: The Owner shall cooperate with the General Contractor and will move their property and the residents as specified in 01 10 00 Sequencing and staging requirements. The General Contractor shall schedule and coordinate the work with the Owner to allow time to accomplish the work. There may be times and situations when minimal amount of work is required that the General Contractor will find it expeditious to move furniture out of workers way. Perform such work.

## 3.05 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.
   1. Legally dispose of materials in a landfill. Do not burn demolished materials.
B. Leave site in clean condition, ready for subsequent work.
C. Clean up spillage and wind-blown debris from public and private lands.

**END OF SECTION**

# SECTION 03 10 00 - CONCRETE FORMING AND ACCESSORIES

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Formwork for cast-in place concrete, with bracing and anchorage.
B. Openings for other work.
C. Form accessories.
D. Form stripping.

### 1.02 RELATED REQUIREMENTS

A. Section 03 20 00 - Concrete Reinforcing.
B. Section 03 30 00 - Cast-in-Place Concrete.

### 1.03 REFERENCE STANDARDS

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010.
B. ACI 301 - Specifications for Structural Concrete; 2016.
C. ACI 318 - Building Code Requirements for Structural Concrete; 2019 (Reapproved 2022).
D. ACI 347R - Guide to Formwork for Concrete; 2014.
E. ASME A17.1 - Safety Code for Elevators and Escalators; 2019.
F. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2015a.
G. PS 1 - Structural Plywood; 2009.

### 1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate pertinent dimensions, materials, bracing, special form joints and reveals, and arrangement, location and pattern of joints and ties. Review is for general architectural applications and features only. Designing formwork for structural stability and efficiency is Contractor's responsibility.
C. Product Data: Material and type of form liners.

## PART 2 PRODUCTS

### 2.01 FORMWORK - GENERAL

A. Provide concrete forms, accessories, and bracing as required to accomplish cast-in-place concrete work .
B. Design and construct to provide resultant concrete that conforms to design with respect to shape, lines, and dimensions.
C. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.
D. Comply with relevant portions of ACI 318, ACI 347R, ACI 301, ACI 347R, ACI 301, ACI 318, ACI 347R, ACI 301, and ACI 318.

### 2.02 WOOD FORM MATERIALS

A. Softwood Plywood: PS 1, B-B High Density Concrete Form Overlay, Class I.
B. Plywood: PS 1, B-B Concrete Form Panels, Class 1, Exterior Grade, mill-applied release agent and edge sealed.

## 2.03 REMOVABLE PREFABRICATED FORMS

A. Preformed Steel Forms: Minimum 16 gage, 0.0598 inch (1.52 mm) thick, matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
B. Preformed Plastic Forms: Thermoplastic polystyrene form liner, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
C. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

## 2.04 FORMWORK ACCESSORIES

A. Form Ties: Removable or snap-off type, galvanized metal, fixed length, cone type, with waterproofing washer, 1 1/2 inch back break dimension, (38 mm back break dimension,) free of defects that could leave holes larger than 1 inch (25 mm) in concrete surface.
B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
    1. Composition: Colorless reactive, mineral oil-based, soy-based, or vegetable-oil based compound.
    2. Do not use materials containing diesel oil or petroleum-based compounds.
    3. Products:
        a. SpecChem, LLC; Bio Strip WB (water-based): www.specchemllc.com/#sle.
        b. W. R. Meadows, Inc; Duogard: www.wrmeadows.com/sle.
        c. Substitutions: See Section 01 60 00 - Product Requirements.
C. Filler Strips for Chamfered Corners: Rigid plastic type; 3/4 x 3/4 inch (19 x 19 mm) size; maximum possible lengths.
D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
E. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05 12 00.

# PART 3 EXECUTION

## 3.01 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

## 3.02 EARTH FORMS

A. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

## 3.03 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

D. Arrange form-facing material in an orderly and symmetrical manner with a minimum of seams.
E. Align joints and make watertight. Keep form joints to a minimum.
F. Obtain approval before framing openings in structural members that are not indicated on drawings.
G. Provide chamfer strips on external corners of beams, joists, and columns.
H. Coordinate this section with other sections of work that require attachment of components to formwork.
I. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Schaefer Architecture before proceeding.

## 3.04 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations. Use low-VOC compound.
B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
C. Coat steel forms with a nonstaining, rust preventative material. Rust-stained steel formwork is not acceptable.
D. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

## 3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.
B. Locate and set in place items that will be cast directly into concrete.
C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.
D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.
E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

## 3.06 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.
B. Clean formed cavities of debris prior to placing concrete.
    1. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
    2. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

## 3.07 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.
B. Construct and align formwork for elevator hoistway in accordance with ASME A17.1.

C. Camber slabs and beams in accordance with ACI 301.

## 3.08 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.
C. Do not reuse wood formwork more than two times for concrete surfaces to be exposed to view. Do not patch formwork.
D. Split, frayed, delaminated or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

## 3.09 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
B. Formwork not supporting weight of concrete, such as sides of beams, walls, columns and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations and providing curing and protection operations are maintained.
C. Formwork supporting weight of concrete, such as beam soffits, joists, slabs and other structural elements, may not be removed in less than 14 days or until concrete has attained at least 75 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.
D. Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.
E. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
F. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

**END OF SECTION**

# SECTION 03 20 00 - CONCRETE REINFORCING

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.
B. Supports and accessories for steel reinforcement.

### 1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories.
B. Section 03 30 00 - Cast-in-Place Concrete.

### 1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete; 2016.
B. ACI 318 - Building Code Requirements for Structural Concrete; 2019 (Reapproved 2022).
C. ACI SP-66 - ACI Detailing Manual; 2004.
D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.
E. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2022a.
F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2018a.
G. AWS D1.4/D1.4M - Structural Welding Code - Steel Reinforcing Bars; 2018, with Amendment (2020).
H. CRSI (DA4) - Manual of Standard Practice; 2009.
I. CRSI (P1) - Placing Reinforcing Bars; 2011.

### 1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices. Include special reinforcing required for openings through concrete structures.
    1. Prepare shop drawings under the supervision of a Professional Structural Engineer experienced in design of work of this type and licensed in Kansas.
C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

### 1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301.

## PART 2 PRODUCTS

### 2.01 REINFORCEMENT

A. Reinforcement Accessories:
    1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch (1.29 mm).
    2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcing bars, dowels and welded wire reinforcement during concrete placement.
    3. For slabs-on-grade and footings, use supports with sand plates or horizontal runners where base material will not support chair legs.

4. For exposed-to-view concrete surfaces and directly plastered surfaces, where legs of supports are in contact with forms: Provide stainless steel or plastic components for placement within 1-1/2 inches (38 mm) of weathering surfaces.
5. Slabs-on-grade Joint Dowel Bars: ASTM A615/A615M Grade 60 (420) smooth steel bars, cut true to length with ends square and free of burrs.

**2.02 FABRICATION**

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.
B. Welding of reinforcement is not permitted, except where specifically defined on the drawings. Weld reinforcing bars according to AWS D1.4/D1.4M where specifically required.
C. Locate reinforcing splices not indicated on drawings at point of minimum stress.
   1. Review locations of splices with Schaefer Architecture.
   2. Clearly define all splice locations on the shop drawing submittal.

**PART 3 EXECUTION**

**3.01 PLACEMENT**

A. Place, support and secure reinforcement against displacement. Do not deviate from required position. Do not tack weld crossing reinforcing bars.
B. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports and as specified.
C. Clean reinforcement of loose rust and mill scale, earth, ice and other materials that reduce or destroy bond with concrete.
D. Conform to applicable code for concrete cover over reinforcement.
E. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
F. Bond and ground all reinforcement to requirements of Electrical Specifications.

**3.02 FIELD QUALITY CONTROL**

A. An independent testing agency, as specified in Section 01 40 00, will inspect installed reinforcement for conformance to contract documents before concrete placement.

**END OF SECTION**

# SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Miscellaneous concrete elements, including equipment pads.
B. Concrete curing.

### 1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories: Forms and accessories for formwork.
B. Section 03 20 00 - Concrete Reinforcing.
C. Section - Mechanical Specification: Mechanical items for casting into concrete.
D. Section - Electrical Specification: Electrical items for casting into concrete.

### 1.03 REFERENCE STANDARDS

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010.
B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
C. ACI PRC-213 - Guide for Structural Lightweight-Aggregate Concrete; 2014 (Reapproved 2023).
D. ACI 301 - Specifications for Structural Concrete; 2016.
E. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.
F. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
G. ACI 305R - Guide to Hot Weather Concreting; 2010.
H. ACI 306R - Guide to Cold Weather Concreting; 2016.
I. ACI 308R - Guide to Curing Concrete; 2001 (Reapproved 2008).
J. ACI 318 - Building Code Requirements for Structural Concrete; 2019 (Reapproved 2022).
K. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.
L. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2021.
M. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2021a.
N. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2013.
O. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.
P. ASTM C150/C150M - Standard Specification for Portland Cement; 2021.
Q. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2007.
R. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016.
S. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).
T. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2017a.
U. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019.
V. ASTM C595/C595M - Standard Specification for Blended Hydraulic Cements; 2017.

W. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2019.
X. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2014.
Y. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.
Z. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014.
AA. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete; 2010a (Reapproved 2015).
BB. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2018.
CC. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2015.
DD. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
EE. ASTM E1155/E1155M - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers; 2023.
FF. ASTM E1155M - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers (Metric); 1996 (Reapproved 2008).
GG. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.
HH. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.

## 1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
   1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.
C. Mix Design: Submit proposed concrete mix design(s).
   1. Submit reports for each concrete material and each mix design test. Reference Structural Notes for mix design requirements.
D. Test Reports: Submit report for each test or series of tests specified.
E. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.
F. Construction and contraction joint layout drawings: Submit proposed layout of construction and contraction joints in foundations, concrete structural elements and systems, and slabs on grade showing compliance with the structure requirements and the specified criteria.

## 1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.
B. Follow recommendations of ACI 305R when concreting during hot weather.
C. Follow recommendations of ACI 306R when concreting during cold weather.

## PART 2 PRODUCTS

### 2.01 FORMWORK

A. Comply with requirements of Section 03 10 00.

### 2.02 REINFORCEMENT

A. Comply with requirements of Section 03 20 00.

### 2.03 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I and I/II Normal, Portland type or ASTM C595/C595M Portland-Limestone blended hydraulic cement, type IL.
   1. Acquire cement for entire project from same source.
B. Fine and Coarse Aggregates: ASTM C 33.
   1. Acquire aggregates for entire project from same source.
   2. For exposed exterior surfaces, do not use fine or coarse aggregates that contain substances that cause spalling.
   3. Local aggregates not complying with ASTM C33/C33M that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Schaefer Architecture.
   4. Fine Aggregates: Clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances.
   5. Coarse Aggregates: Clean, uncoated, processed from natural rock or stone containing no clay, loam or foreign matter. Unless otherwise noted or mass concrete, use aggregate meeting #57 or #67 grading requirements, except for toppings, aggregates shall meet #7 grading requirements.
C. Fly Ash: ASTM C618, Class C.
   1. Do not use fly ash in exposed, finished concrete.
D. Water: Clean, potable and not detrimental to concrete.

### 2.04 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
   1. Do not use calcium chloride or admixtures containing calcium chloride.
B. Air Entrainment Admixture: ASTM C260/C260M.
C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
E. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.
F. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
G. Accelerating Admixture: ASTM C494/C494M Type C.
H. Retarding Admixture: ASTM C494/C494M Type B.
I. Water Reducing Admixture: ASTM C494/C494M Type A.

### 2.05 ACCESSORY MATERIALS

A. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch (13.7 MPa).
   2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch (48 MPa).

## 2.06 BONDING AND JOINTING PRODUCTS

A. See Section 03 01 00 - Maintenance of Concrete and 03 10 00 - Concrete Forming and Accessories.

## 2.07 CURING MATERIALS

A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
   1. Manufacturers:
      a. Dayton Superior Corporation; AquaFilm Concentrate J74: www.daytonsuperior.com/#sle.
      b. Euclid Chemical Company ; EUCOBAR: www.euclidchemical.com/#sle.
      c. SpecChem, LLC; SpecFilm Concentrate or SpecFilm RTU: www.specchemllc.com/#sle.
      d. W. R. Meadows, Inc; Evapre or Evapre-RTU: www.wrmeadows.com/#sle.
      e. Metalcrete Industries; Waterhold: www.metalcreteindustries.com.
      f. L & M Construction Chemicals, Inc.; E-Con: www.lmcc.com.
      g. Substitutions: See Section 01 60 00 - Product Requirements.

B. Curing and Sealing Compound: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C309 Type I Class B.
   1. Application: Use at interior and exterior concrete and at applications approved by manufacturer.
   2. Vehicle: Water-based.
   3. Solids by Mass: 18 percent, minimum.
   4. VOC Content: OTC compliant.
   5. Manufacturers:
      a. Dayton Superior Corporation; Cure & Seal 309 EF: www.daytonsuperior.com/#sle.
      b. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; Dress & Seal WB: www.lmcc.com/#sle.
      c. SpecChem, LLC; Cure and Seal WB: www.specchemllc.com/#sle.
      d. Metalcrete Industries; Metcure 0800: www.metalcreteindustries.com.
      e. Euclid Chemical Company; Aqua-Cure VOX: www.euclidchemical.com.
      f. W.R, Meadows, Inc.; VOCOMP-20: www.wrmeadows.com.
      g. BASF Construction Chemicals; MasterKure CC 180 WB: www.buildingsystems.basf.com.

C. Curing and Sealing Compound, Low Gloss: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C1315 Type 1 Class A.
   1. Application: Use at interior and exterior concrete and at applications approved by manufacturer.
   2. Vehicle: Solvent-based.
   3. Solids by Mass: 25 percent, minimum.
   4. VOC Content: OTC compliant.
   5. Manufacturers:
      a. Dayton Superior Corporation; Cure & Seal 1315 J22WB: www.daytonsuperior.com/#sle.

b. Dayton Superior Corporation; Cure & Seal 1315 EF: www.daytonsuperior.com/#sle.
c. BASF Construction Chemicals; Kure 1315: www.buildingsystems.basf.com.
d. L & M Construction Chemicals; Dress & Seal WB 25: www.lmcc.com.
e. Metalcrete Industries; Metcure 30: www.metalcreteindustries.com.
f. SpecChem, LLC; Cure and Seal WB 25: www.specchemllc.com.
g. W. R. Meadows, Inc; VOCOMP-25: www.wrmeadows.com/#sle.
h. Substitutions: See Section 01 60 00 - Product Requirements.

D. Moisture-Retaining Sheet: ASTM C171.
1. Curing paper, regular.
2. Polyethylene film, clear, minimum nominal thickness of 0.0040 inch (0.10 mm).
3. White-burlap-polyethylene sheet, weighing not less than 10 ounces per linear yard, 40 inches wide (305 g/sq m).

E. Polyethylene Film: ASTM D2103, 4 mil (0.1 mm) thick, clear.
F. Water: Potable, not detrimental to concrete.

## 2.08 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
1. For trial mixtures method, employ independent testing agency acceptable to Schaefer Architecture for preparing and reporting proposed mix designs.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
D. Normal Weight Concrete:
1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: As indicated on drawings.
2. Fly Ash Content: Maximum 20 percent of cementitious materials by weight. In no case shall the amount of the fly ash per cubic yard of concrete exceed 100 pounds (45 kg).
3. Water-Cement Ratio: Locations for each mix are scheduled on Structural Drawings.
a. Maximum 45 percent by weight for 4000 psi (27.6 MPa) concrete.
b. Maximum 50 percent by weight for 3500 psi (24.2 MPa) concrete.
c. Maximum 55 percent by weight for non-air-entrained 3000 psi (20.7 MPa) concrete.
d. Maximum 50 percent by weight for air-entrained 3000 psi (20.7 MPa) concrete.
4. Total Air Content: 4 - 7 percent, determined in accordance with ASTM C173/C173M.
a. For exterior exposed concrete.
5. Maximum Slump:
a. Ramps and sloping slab surfaces: not more than 3 inch (76 mm).
b. Reinforced foundation systems: not less than 3 inch (76 mm) and not more than 5 inch (127 mm).
c. Concrete containing high-range water-reducing admixture (superplasticizers): not more than 8 inch (203 mm) after adding admixture to site-verified 2 -3 inch (51 - 76 mm) slump concrete.
d. Other concrete: not less than 3 inch (76 mm) and not more than 5 inch (127 mm).

6. Aggregates: Proportion aggregates to provide a minimum of 50% coarse aggregate ratio to total aggregate.
7. Maximum Aggregate Size: 3/4 inch (19 mm), unless noted or approved otherwise.
8. Admixtures:
    a. Use water-reducing admixture or high-range water-reducing admixture (superplasticizers) in concrete, as required, for placement and workability.
    b. Use accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg F (10 def C).
    c. Use mid-range or high-range water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs, architectural concrete, parking structure slabs, concrete required to be watertight, and concrete with water-cement ratios below 0.50.
    d. Use air-entraining admixture in exterior exposed concrete unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content of 5 1/2 percent with a tolerance of plus or minus 1 1/2 percent.
    e. Other concrete not exposed to freezing, thawing, or hydraulic pressure, or to receive a surface hardener: 2 to 4 percent air.
    f. Use admixtures for water reduction and set accelerating or retarding in strict compliance with manufacturer's directions.

## 2.09 MIXING

A. Transit Mixers: Comply with ASTM C 94/C 94M.
    1. The addition of water to a batch at the job site will only be allowed when the Owner, Schaefer Architecture, Structural Engineer and the General Contractor agree to the following defined criteria at the preconstruction meeting. This criteria must be strictly met when water is added to a batch at the job site.
        a. Water shall only be allowed to be added to a batch at the site if the measured concrete slump is less than 3 inch (76.2 mm).
        b. When allowed, water should only be added once to the batch on-site and the addition of the water must be completed within 15 minutes from the start of the water addition.
        c. The on-site added water must be properly mixed to ensure that a homogenous mixture is attained.
        d. The maximum amount of water which may be added to the batch on-site is 1 gallon (3.78 liter) of water per 1 cu. yd. (0.76 cu. m) of concrete.
        e. After the on-site added water has been added to the batch and the batch has been properly mixed, the concrete shall have a measured slump within the defined slump range of 3 inches (76.2 mm) to 5 inches (127 mm)
        f. Concrete shall be rejected if the slump, after the addition of on-site water, does not occur with the slump range of 3 inches (76.2 mm) to 5 inches (127 mm) or is deemed unacceptable for placement.
        g. The field testing and inspection agency or an approved Representative of the Owner shall monitor the implementation of the slump measurements and the water addition procedures.
    2. When air temperature is between 85 deg F (29 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1 1/2 hours to 75 minutes, and when air

temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

### 3.02 PREPARATION

A. Verify that forms are clean and free of rust before applying release agent.
B. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
C. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
    1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
D. Where new concrete with integral waterproofing is to be bonded to previously placed concrete, prepare surfaces to be treated in accordance with waterproofing manufacturer's instructions. Saturate cold joint surface with clean water, and remove excess water before application of coat of waterproofing admixture slurry. Apply slurry coat uniformly with semi-stiff bristle brush at rate recommended by waterproofing manufacturer.
E. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels in holes filled with an approved epoxy or adhesive.

### 3.03 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.
B. Place concrete for floor slabs in accordance with ACI 302.1R.
C. Notify Schaefer Architecture not less than 24 hours prior to commencement of placement operations.
D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
E. Ensure reinforcement, inserts, waterstops, and embedded parts will not be disturbed during concrete placement.
    1. Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.
    2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles, and other conditions.
    3. Install dovetail anchor slots in concrete structures as indicated on drawings
F. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

G. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.
H. Repair underslab vapor barrier damaged during placement of concrete reinforcing. Repair with vapor barrier material; lap over damaged areas minimum 6 inches (150 mm) and seal watertight.

**3.04 SLAB JOINTING**

A. Anchor joint fillers and devices to prevent movement during concrete placement.
B. Construction Joints
   1. Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to Schaefer Architecture.
   2. Do not locate construction joints across rooms where any type of flooring will be applied except in inconspicuous places such as end of corridors, edge of walls, at doorways, etc.
   3. Provide keyways at least 1 1/2 inch (38 mm) deep in construction joints between slabs and where detailed. Bulkheads designed and accepted for this purpose may be used for slabs.
   4. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise.
   5. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
C. Isolation Joints in Slabs-on-Grade
   1. Construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
D. Contraction (Control) Joints in Slabs-on-Grade
   1. General: Construct contraction joints in slabs-on-grade to form panels of patterns as noted or shown. Use tool cuts 1/8 inch (3 mm) wide by one-fourth of slab depth or inserts 1/4 inch (6 mm) wide by one-fourth of slab depth or saw cutting to a depth not less than 10 percent of slab thickness with a 1 inch (25 mm) minimum depth.
   2. Tooled Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate grooved tool marks on concrete surfaces. Tool edges in exposed slabs.
   3. Saw cutting of floor slabs, curbs and vehicle paving:
      a. Slabs may be sawed if cut immediately and within 2 hours following final troweling using a “Soff-cut” saw or early entry dry-cutting saw system. Install cuts as soon as concrete will support weight of saw and operator without disturbing final finish.
   4. Inserts: Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.
   5. If joint pattern is not shown, provide joints not exceeding 15 feet (4.5 m) in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third bays).

E. Placing Concrete in Forms
   1. Deposit concrete in forms in horizontal layers no deeper than 24 inch (600 mm) and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
   2. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.
   3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate placed layer and at least 6 inch (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.

F. Placing Concrete Slabs
   1. Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.
   2. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
   3. Maintain reinforcing in proper position on chairs during concrete placement.
   4. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of lumps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

## 3.05 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
   1. All Floors: F(F) of 25; F(L) of 20.
   2. At Polished Concrete Floors: F(F) of 50; F(L) of 45.
      a. See Section 03 35 36 for additional requirements.

B. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155/E1155M (ASTM E1155M), within 48 hours after slab installation; report both composite overall values and local values for each measured section.

C. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.

D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

## 3.06 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch (6 mm) or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch (6 mm) or more in height. For surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to

concrete, such as waterproofing, dampproofing, veneer plaster, painting, or another similar system. Provide finish as follows:

1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
2. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.
    a. Combine one part portland cement to one and one-half parts fine sand by volume, and a 50:50 mixture of acrylic or styrene butadiene-based bonding admixture and water to form the consistency of thick paint. Blend standard portland cement and white portland cement in amounts determined by trial patches so that final color of dry grout will match adjacent surfaces.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

E. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:

1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
2. Decorative Exposed Surfaces: Trowel as described in ACI 302.1R; use steel-reinforced plastic trowel blades instead of steel blades to avoid black-burnish marks; decorative exposed surfaces include surfaces to be stained or dyed, pigmented concrete, and surfaces to be polished.
    a. Steel-Reinforced Plastic Trowel Blade Manufacturer: Wagman Metal Products, Inc: www.wagmanmetal.com/#sle.
    b. After slab has cured and at the time of substantial completion, thoroughly clean and buff exposed concrete floor surfaces and recoat with Curing and Sealing compound per manufacturer's instructions.
3. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.
    a. Sealer: After slab has cured and at the time of substantial completion, thoroughly clean and buff exposed concrete floor surfaces and recoat with Curing and Sealing Compound per manufacturer's instructions.
4. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply a trowel finish as specified, then immediately follow by slightly scarifying the surface with a fine broom.
5. Non-Slip Broom Finish: Apply a nonslip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
    a. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Schaefer Architecture before application.

F. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

1. Approve floor drain elevations with Schaefer Architecture prior to pouring floors. Drain elevations shall be coordinated with type and size of floor tile or other scheduled floor finish.
2. At individual showers, set top of drains 3/4 inch (19 mm) below floor elevation.

## 3.07 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

## 3.08 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
   1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308R, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12 inch (300 mm) lap over adjacent absorptive covers.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inch (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
      a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
      b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
      c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
   3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy

rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

## 3.09 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

1. Contractor may perform field tests and cast compression test specimens if specimens are prepared and handled by person(s) trained and CERTIFIED for sampling concrete.

C. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

D. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure four concrete test cylinders. Obtain test samples for every 50 cubic yards (38 cu m) or less of each class of concrete placed.

1. One specimen tested at 7 days, two specimens tested at 28 days and one specimen retained in reserve for later testing if required.

E. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

F. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

G. Air Content Test: ASTM C173/C173M, volumetric method for lightweight or normal weight concrete; ASTM C231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.

H. Concrete Temperature: ASTM C1064/C1064M; one test hourly when air temperature is 40 deg F (4 deg C) and below, when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.

I. Test Results: The testing agency shall report test results in writing to Schaefer Architecture and General Contractor within 24 hours of test.

1. Reports of compressive strength tests shall contain the following:
   a. Project identification name and number
   b. Date of concrete placement
   c. Name of concrete testing service
   d. Concrete type and class
   e. Location of concrete batch in structure
   f. Design compressive strength at 28 days
   g. Concrete mix proportions and materials

h. Compressive breaking strength
i. Type of break for both 7-day tests and 28-day tests
j. Site measured slump, temperature and air-content

## 3.10 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
   1. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, General Contractor shall evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
   2. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi (3.4 MPa).
B. Repair or replacement of defective concrete will be determined by Schaefer Architecture. The cost of additional testing shall be borne by General Contractor when defective concrete is identified.
   1. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
   2. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Schaefer Architecture. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M, or by other methods as directed.
C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Schaefer Architecture for each individual area.

## 3.11 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

**END OF SECTION**

## 22 05 05 PLUMBING GENERAL PROVISIONS

### PART 1 GENERAL

**GENERAL INFORMATION:**

The General Requirements and Supplementary Conditions are part of this contract and govern work under this division.

**SCOPE OF WORK:**

Work by Mechanical Contractor: Provide all mechanical systems indicated by the drawings, specified or as instructed otherwise. Unless specified otherwise, provide all labor, materials and equipment necessary to provide a complete and operational system.

Work by Electrical Contractor: Provide all line voltage wiring and install items of equipment furnished by the Mechanical, such as thermostats, remote control panels, etc.

Mechanical and Electrical Coordination: The Mechanical will provide to the Electrical all manufacturer's wiring diagrams and installation data and locate all equipment furnished to the Electrical.

Where work or materials are specified or shown on drawings to be performed by more than one Contractor, each such Contractor will be deemed to have figured the item and the Architect will determine who shall furnish the work and who shall submit the credit to the Owner.

Work by General Contractor: Provide all openings and chases with proper framing and reinforcing as required for Mechanical equipment.

Provide access panels or doors where required for mechanical systems.

Provide concrete pads for all base mounted mechanical equipment.

**DEFINITIONS:**

Contractor: The contractor performing work under this Division of the Specifications.

Provide: Contractor is responsible to furnish and install component completely.

**QUALITY ASSURANCE:**

Manufacturers: Acceptable manufacturers are listed in applicable sections of the Specifications and on the drawings.

Drawings and Specifications are complimentary. Requirements indicated in either are binding and the most stringent is to be used.

The Contractor is to review documents for the work, and if any discrepancies occur between the work of this Division and the work of another Division, is to notify the Architect and obtain written instructions for any changes necessary. Any changes in the work by this Division made necessary by the failure or neglect of the Contractor to report such discrepancies will be made by, and at the expense of the Contractor.

Changes in Design or Installation: Refer to the General and Supplementary Conditions for requirements pertaining to changes in design and installation. Mechanical installation will otherwise be in accordance with the Contract Drawings and Specifications.

**REGULATORY AGENCIES:**

Permits and Fees: The Contractor is to pay for all permits and fees as required by Local or State regulatory agencies.

Codes: Work for this project is to comply with Federal, State and Local codes, ordinances and regulations. All work shall comply the latest adopted edition of the Building Code and associated sections of the National Fire Protection Association.

Work shall be done according to applicable codes in cases of conflict between specifications, plans and codes, except where plans and specifications call for higher standards than the codes.

**SUBMITTALS AND SHOP DRAWINGS:**

Submit product data and copies of shop drawings for all major pieces of equipment as indicated in the respective sections of this Division.

The intent of shop drawing submittals by the Contractor is to demonstrate to the Architect / Engineer that the Contractor understands the design concept and demonstrates his understanding by indicating and detailing the fabrication and installation methods to be used.

If deviations, discrepancies or conflicts between shop drawing submittals and Contract Documents are discovered either prior to or after shop drawing submittals are processed, the design drawings and specifications shall take precedence.

The Architect / Engineer shall review shop drawings for general conformance with the design concept of the project. The review shall not relieve the Contractor of the responsibility of compliance with the contract documents or errors in the shop drawings.

**PRODUCT DELIVERY, STORAGE AND HANDLING:**

Make provisions for the delivery and safe storage of all material and make the required arrangements with other trades to coordinate moving large pieces of equipment into the building.

Where materials are indicated to be "Furnished by Others" to the Contractor for installation, these materials shall be checked and their delivery properly receipted. After delivery the Contractor assumes all responsibility for the safekeeping of such equipment.

All materials stored outside are to be covered and protected with weatherproof material.

**JOB CONDITIONS:**

Verify existing site conditions and location prior to bidding.

Verify existing utilities and the actual location of in reference to location of such as shown on drawings. Any deviations between actual conditions and plan locations will be reviewed with the Architect. Repair, patch or terminate utilities encountered in an acceptable manner regardless of whether shown or not.

**GUARANTEE:**

The Contractor is to guarantee all materials, equipment, workmanship and operation of all systems for a period of one (1) year from the date of final acceptance of the entire project. Guarantee to repair or replace at Contractor's expense any art of the work which may be defective during that time provided that such defect is, in the opinion of the Architect / Engineer, due to imperfect material or workmanship and not to carelessness or improper use.

## PART 2 PRODUCTS

**STANDARDS FOR EQUIPMENT AND MATERIALS:**

All material shall be labeled UL, ETL, AGA or other approved independent testing authority.

All pressure rated vessels shall be provided with an ASME stamp, meeting the ASME Code or the Local Authority, whichever is most stringent.

All materials and equipment shall be of the best quality and be new, unused and without damage.

System design is based upon the first manufacturer listed in the Specifications and the other named manufacturers are considered equivalent. Any costs attributed in changes in ductwork, piping, plumbing, space clearances or other trades is to be borne by the Contractor when another manufacturer is used in lieu of the first listed.

**MATERIALS OF APPROVED EQUAL:**

Unless request for changes in base bid specifications are received and approved ten (10) days prior to the opening of bids, the successful Contractor will be held to furnish specified items under base bid.

## PART 3 EXECUTION

**PREPARATION:**

Base final installation of all materials and equipment on field dimensions and conditions at the building. The Mechanical Contractor is to inspect all work that affects the work of this Division and report any deficiencies to the General Contractor and Architect. No extra compensation will be allowed on account of minor differences in actual dimensions and those indicated on the plans.

**INSTALLATION:**

Workmanship: Perform all work in accordance with good commercial practice.

Supervision: The superintendent shall be responsible for the work of this Division and of all subcontractors under this Division. All questions or directions will be directed through the superintendent.

Installation Procedures:

A. Field verify exact location, size, routing, elevation and accessibility of existing and new HVAC and plumbing systems.

B. Properly size and locate all anchors, chases, recesses and openings required for the proper installation of the work.
C. Piping and equipment located in areas subject to low temperatures shall be installed in a manner to prevent freezing.
D. All equipment and materials are to be installed as high as possible.
E. Install equipment and systems in accordance with manufacturer's recommends, accepted industry standards and all applicable Codes.

**END OF SECTION**

## 22 05 06 BASIC PLUMBING MATERIALS AND METHODS

### PART 1 GENERAL

**RELATED DOCUMENTS:**

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

**SUMMARY:**

This Section includes the following basic mechanical materials and methods to complement other Division 22 Sections.

A. Piping materials and installation instructions common to most piping systems.
B. Concrete base construction requirements.
C. Escutcheons.
D. Dielectric fittings.
E. Flexible connectors.
F. Mechanical sleeve seals.
G. Equipment nameplate data requirements.
H. Labeling and identifying mechanical systems and equipment is specified in Division 15 Section "Mechanical Identification."
I. Nonshrink grout for equipment installations.
J. Field-fabricated metal and wood equipment supports.
K. Installation requirements common to equipment specification sections.
L. Mechanical demolition.
M. Cutting and patching.
N. Touchup painting and finishing.

Plumbing pipe and pipe fitting materials are specified in Division 22 piping system Sections.

**DEFINITIONS:**

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.

Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

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.

The following are industry abbreviations for plastic materials:

A. ABS: Acrylonitrile-butadiene-styrene plastic.
B. CPVC: Chlorinated polyvinyl chloride plastic.
C. NP: Nylon plastic.
D. PE: Polyethylene plastic.
E. PVC: Polyvinyl chloride plastic.

The following are industry abbreviations for rubber materials:

A. CR: Chlorosulfonated polyethylene synthetic rubber.
B. EPDM: Ethylene propylene diene terpolymer rubber.

**SUBMITTALS:**

Product Data: For dielectric fittings, flexible connectors, mechanical sleeve seals, and identification materials and devices.

Shop Drawings: Detail fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.

**QUALITY ASSURANCE:**

Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

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.

**DELIVERY, STORAGE, AND HANDLING:**

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.

Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.

Protect flanges, fittings, and piping specialties from moisture and dirt.

Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

**SEQUENCING AND SCHEDULING:**

Coordinate mechanical equipment installation with other building components.

Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.

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.

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.

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 Section "Access Doors."

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.

## PART 2 PRODUCTS

**MANUFACTURERS:**

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

A. Dielectric Unions:
   1. Capitol Manufacturing Co.
   2. Central Plastics Co.
   3. Eclipse, Inc.; Rockford-Eclipse Div.
   4. Epco Sales Inc.
   5. Hart Industries International, Inc.
   6. Watts Industries, Inc.; Water Products Div.
   7. Zurn Industries, Inc.; Wilkins Div.

B. Dielectric Flanges:
   1. Capitol Manufacturing Co.
   2. Central Plastics Co.
   3. Epco Sales Inc.
   4. Watts Industries, Inc.; Water Products Div.

C. Dielectric-Flange Insulating Kits:
   1. Calpico, Inc.
   2. Central Plastics Co.

D. Dielectric Couplings:
   1. Calpico, Inc.
   2. Lochinvar Corp.

E. Dielectric Nipples:
   1. Grinnell Corp.; Grinnell Supply Sales Co.
   2. Perfection Corp.

3. Victaulic Co. of America.

F. Metal, Flexible Connectors:
   1. ANAMET Industrial, Inc.
   2. Central Sprink, Inc.
   3. Flexicraft Industries.
   4. Flex-Weld, Inc.
   5. Grinnell Corp.; Grinnell Supply Sales Co.
   6. Hyspan Precision Products, Inc.
   7. McWane, Inc.; Tyler Pipe; Gustin-Bacon Div.
   8. Mercer Rubber Co.
   9. Metraflex Co.
   10. Proco Products, Inc.
   11. Uniflex, Inc.
   12. Flexonics.

**PIPE AND PIPE FITTINGS:**

Refer to individual Division 22 piping Sections for pipe and fitting materials and joining methods.

Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

**JOINING MATERIALS:**

Refer to individual Division 15 piping Sections for special joining materials not listed below.

Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

A. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness, unless thickness or specific material is indicated.
   1. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   2. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

Solder Filler Metals: ASTM B 32.

A. Alloy Sn95 or Alloy Sn94: Approximately 95 percent tin and 5 percent silver, with 0.10 percent lead content.
B. Alloy E: Approximately 95 percent tin and 5 percent copper, with 0.10 percent maximum lead content.

Brazing Filler Metals: AWS A5.8.

A. BCuP Series: Copper-phosphorus alloys.

B. BAg1: Silver alloy.

Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

Solvent Cements: Manufacturer's standard solvent cements for the following:

A. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

Plastic Pipe Seals: ASTM F 477, elastomeric gasket.

Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.

Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.

A. Sleeve: ASTM A 126, Class B, gray iron.
B. Followers: ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 536 ductile iron.
C. Gaskets: Rubber.
D. Bolts and Nuts: AWWA C111.
E. Finish: Enamel paint.

**DIELECTRIC FITTINGS:**

General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.

Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.

Insulating Material: Suitable for system fluid, pressure, and temperature.

Dielectric Unions: Factory-fabricated, union assembly, for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C).

Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig (1035- or 2070-kPa) minimum working pressure as required to suit system pressures.

Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

A. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig (1035- or 2070-kPa) minimum working pressure as required to suit system pressures.

Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

**FLEXIBLE CONNECTORS:**

General: Fabricated from materials suitable for system fluid and that will provide flexible pipe connections. Include 125-psig (860-kPa) minimum working-pressure rating, unless higher working pressure is indicated, and ends according to the following:

A. 2-Inch NPS (DN50) and Smaller: Threaded.
B. 2-1/2-Inch NPS (DN65) and Larger: Flanged.
C. Option for 2-1/2-Inch NPS (DN65) and Larger: Grooved for use with keyed couplings.

Bronze-Hose, Flexible Connectors: Corrugated, bronze, inner tubing covered with bronze wire braid. Include copper-tube ends or bronze flanged ends, braze welded to hose.

Stainless-Steel-Hose/Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include steel nipples or flanges, welded to hose.

Stainless-Steel-Hose/Stainless-Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include stainless-steel nipples or flanges, welded to hose.

**PIPING SPECIALTIES:**

Sleeves: The following materials are for wall, floor, slab, and roof penetrations:

A. Steel Sheet Metal: 0.0239-inch (0.6-mm) minimum thickness, galvanized, round tube closed with welded longitudinal joint.
B. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
    1. Underdeck Clamp: Clamping ring with set screws.

Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.

A. ID: Closely fit around pipe, tube, and insulation of insulated piping.
B. OD: Completely cover opening.
C. Cast Brass: One piece, with set screw.
    1. Finish: Rough brass.
    2. Finish: Polished chrome-plate.

D. Cast Brass: Split casting, with concealed hinge and set screw.
    1. Finish: Rough brass.
    2. Finish: Polished chrome-plate.

E. Stamped Steel: One piece, with set screw and chrome-plated finish.
F. Stamped Steel: One piece, with spring clips and chrome-plated finish.
G. Stamped Steel: Split plate, with concealed hinge, set screw, and chrome-plated finish.
H. Stamped Steel: Split plate, with concealed hinge, spring clips, and chrome-plated finish.
I. Stamped Steel: Split plate, with exposed-rivet hinge, set screw, and chrome-plated finish.
J. Stamped Steel: Split plate, with exposed-rivet hinge, spring clips, and chrome-plated finish.

K. Cast-Iron Floor Plate: One-piece casting.

**GROUT:**

Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.

A. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
B. Design Mix: 5000-psig (34.5-MPa), 28-day compressive strength.
C. Packaging: Premixed and factory packaged.

## PART 3 EXECUTION

**PIPING SYSTEMS - COMMON REQUIREMENTS:**

General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 22 piping Sections specify unique piping installation requirements.

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.

Install piping at indicated slope.

Install components with pressure rating equal to or greater than system operating pressure.

Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

Install piping free of sags and bends.

Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

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.

Install piping to allow application of insulation plus 1-inch (25-mm) clearance around insulation.

Locate groups of pipes parallel to each other, spaced to permit valve servicing.

Install fittings for changes in direction and branch connections.

Install couplings according to manufacturer's written instructions.

Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:

A. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish. Use split-casting escutcheons if required, for existing piping.

B. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
C. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
D. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
E. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.

Sleeves are not required for core drilled holes.

Permanent sleeves are not required for holes formed by PE removable sleeves.

Install sleeves for pipes passing through concrete and masonry walls, and concrete floor and roof slabs.

Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

A. Cut sleeves to length for mounting flush with both surfaces.
   1. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

B. Build sleeves into new walls and slabs as work progresses.
C. Install sleeves large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
   1. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS (DN150).
   2. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS (DN150) and larger, penetrating gypsum-board partitions.
   3. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level. Refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.
      a. Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.

D. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants. Refer to Division 7 Section "Joint Sealants" for materials.
E. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.

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 Section "Firestopping" for materials.

Verify final equipment locations for roughing-in.

Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
C. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. 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.
   2. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
   3. Align threads at point of assembly.
   4. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
   5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

F. 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.
G. 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.
H. 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:
   1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
   2. PVC Pressure Piping: ASTM D 2672.
   3. PVC Nonpressure Piping: ASTM D 2855.

Piping Connections: Make connections according to the following, unless otherwise indicated:

A. Install unions, in piping 2-inch NPS (DN50) and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS (DN50) or smaller threaded pipe connection.
B. Install flanges, in piping 2-1/2-inch NPS (DN65) and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
C. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
D. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

**EQUIPMENT INSTALLATION - COMMON REQUIREMENTS:**

Install equipment to provide maximum possible headroom, if mounting heights are not indicated.

Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.

Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

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.

Install equipment giving right of way to piping installed at required slope.

Install flexible connectors on equipment side of shutoff valves, horizontally and parallel to equipment shafts if possible.

**PAINTING AND FINISHING:**

Refer to Division 9 Section "Painting" for paint materials, surface preparation, and application of paint.

Apply paint to exposed piping according to the following, unless otherwise indicated:

A. Interior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
B. Interior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
C. Interior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
D. Exterior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
E. Exterior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
F. Exterior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.

Do not paint piping specialties with factory-applied finish.

Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

**CONCRETE BASES:**

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 setting templates for anchor bolt and tie locations. Use 3000-psig (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

**ERECTION OF METAL SUPPORTS AND ANCHORAGE:**

Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

**DEMOLITION:**

Disconnect, demolish, and remove Work specified in Division 22 Sections.

If pipe, ductwork, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.

Accessible Work: Remove indicated exposed pipe and ductwork in its entirety.

Work Abandoned in Place: Cut and remove underground pipe a minimum of 2 inches (50 mm) beyond face of adjacent construction. Cap and patch surface to match existing finish.

Removal: Remove indicated equipment from Project site.

Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

**CUTTING AND PATCHING:**

Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.

Repair cut surfaces to match adjacent surfaces.

**GROUTING:**

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.

Clean surfaces that will come into contact with grout.

Provide forms as required for placement of grout.

Avoid air entrapment during placing of grout.

Place grout, completely filling equipment bases.

Place grout on concrete bases to provide smooth bearing surface for equipment.

Place grout around anchors.

Cure placed grout according to manufacturer's written instructions.

**END OF SECTION**

## 22 05 19 METERS AND GAGES FOR PLUMBING PIPING

### PART 1 GENERAL

**RELATED DOCUMENTS:**

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

**SUMMARY:**

This Section includes meters and gages for mechanical systems and water meters installed outside the building.

Related Sections include the following:

A. Mechanical equipment Sections that specify meters and gages as part of factory-fabricated equipment.

**SUBMITTALS:**

Product Data: Include scale range, ratings, and calibrated performance curves for each meter, gage, fitting, specialty, and accessory specified. Include schedule indicating manufacturer's number, scale range, fittings, and location for each meter and gage.

### PART 2 PRODUCTS

**MANUFACTURERS:**

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

A. Liquid-in-Glass Thermometers:
   1. Dresser Industries, Inc.; Instrument Div.; Weksler Instruments Operating Unit.
   2. Ernst Gage Co.
   3. Marsh Bellofram.
   4. Palmer Instruments, Inc.
   5. Trerice: H. O. Trerice Co.
   6. Weksler.

B. Direct-Mounting, Filled-System Dial Thermometers:
   1. Dresser Industries, Inc.; Instrument Div.; Weksler Instruments Operating Unit.
   2. Marsh Bellofram.
   3. Trerice: H. O. Trerice Co.
   4. Weksler.

C. Bimetal Dial Thermometers:
   1. Dresser Industries, Inc.; Instrument Div.; Weksler Instruments Operating Unit.
   2. Ernst Gage Co.
   3. Marsh Bellofram.
   4. Trerice: H. O. Trerice Co.
   4. Weksler.

E. Insertion Dial Thermometers:
   1. Dresser Industries, Inc.; Instrument Div.; Weksler Instruments Operating Unit.
   2. Trerice: H. O. Trerice Co.
   3. Weiss Instruments, Inc.
   4. Weksler.

F. Pressure Gages:
   1. Dresser Industries, Inc.; Instrument Div.; Weksler Instruments Operating Unit.
   2. Ernst Gage Co.
   3. Marsh Bellofram.
   4. Weiss Instruments, Inc.
   4. Weksler.

G. Test Plugs:
   1. Peterson Equipment Co., Inc.
   2. Trerice: H. O. Trerice Co.
   3. Watts Industries, Inc.; Water Products Div.

**THERMOMETERS, GENERAL:**

Scale Range: Temperature ranges for services listed are as follows:

A. Domestic Hot Water: 30 to 240 deg F, with 2-degree scale divisions (0 to 115 deg C, with 1-degree scale divisions).
B. Domestic Cold Water: 0 to 100 deg F, with 2-degree scale divisions (minus 18 to plus 38 deg C, with 1-degree scale divisions).

Accuracy: Plus or minus 1 percent of range span or plus or minus one scale division to maximum of 1.5 percent of range span.

**LIQUID-IN-GLASS THERMOMETERS:**

Description: ASTM E 1.

Case: Die cast and aluminum finished in baked-epoxy enamel, glass front, spring secured, 9 inches (230 mm) long.

Adjustable Joint: Finish to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.

Tube: Red or blue reading, organic-liquid filled with magnifying lens.

Scale: Satin-faced nonreflective aluminum with permanently etched markings.

Stem: Copper-plated steel, aluminum, or brass for separable socket; of length to suit installation.

**DIRECT-MOUNTING, FILLED-SYSTEM DIAL THERMOMETERS:**

Description: Vapor-actuated, universal-angle dial type.

Case: Drawn steel or cast aluminum, with 4-1/2-inch- (115-mm-) diameter, glass lens.

Adjustable Joint: Finish to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.

Thermal Bulb: Copper with phosphor-bronze bourdon pressure tube.

Movement: Brass, precision geared.

Scale: Progressive, satin-faced nonreflective aluminum with permanently etched markings.

Stem: Copper-plated steel, aluminum, or brass for separable socket; of length to suit installation.

**BIMETAL DIAL THERMOMETERS:**

Description: ASME B40.3; direct-mounting, universal-angle dial type.

Case: Stainless steel with 5-inch- (125-mm-) diameter, glass lens.

Adjustable Joint: Finish to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.

Element: Bimetal coil.

Scale: Satin-faced nonreflective aluminum with permanently etched markings.

Stem: Stainless steel for separable socket, of length to suit installation.

**INSERTION DIAL THERMOMETERS:**

Description: ASME B40.3, bimetal type.

Dial: 1-inch (25-mm) diameter.

Case: Stainless steel.

Stem: Dustproof and leakproof 1/8-inch- (3-mm-) diameter, tapered-end stem with nominal length of 5 inches (125 mm).

**SEPARABLE SOCKETS:**

Description: Fitting with protective socket for installation in threaded pipe fitting to hold fixed thermometer stem.

A. Material: Brass, for use in copper piping.
B. Material: Steel, for use in steel piping.
C. Extension-Neck Length: Nominal thickness of 2 inches (50 mm), but not less than thickness of insulation. Omit extension neck for sockets for piping not insulated.
D. Insertion Length: To extend to center of pipe.
E. Heat-Transfer Fluid: Oil or graphite.

**THERMOMETER WELLS:**

Description: Fitting with protective well for installation in threaded pipe fitting to hold test thermometer.

A. Material: Brass, for use in copper piping.
B. Material: Steel, for use in steel piping.
C. Extension-Neck Length: Nominal thickness of 2 inches (50 mm), but not less than thickness of insulation. Omit extension neck for wells for piping not insulated.
D. Insertion Length: To extend to center of pipe.
E. Heat-Transfer Fluid: Oil or graphite.

**PRESSURE GAGES:**

Description: ASME B40.1, phosphor-bronze bourdon-tube type with bottom connection; dry type, unless liquid-filled-case type is indicated.

Case: Drawn steel, brass, or aluminum with 4-1/2-inch- (115-mm-) diameter, glass lens.

Connector: Brass, NPS 1/4 (DN8).

Scale: White-coated aluminum with permanently etched markings.

Accuracy: Grade A, plus or minus 1 percent of middle 50 percent of scale.

Range: Comply with the following:

A. Vacuum: 30 inches Hg of vacuum to 15 psig of pressure (100 kPa of vacuum to 103 kPa of pressure).
B. Fluids under Pressure: Two times the operating pressure.

**PRESSURE-GAGE FITTINGS:**

Valves: NPS 1/4 (DN8) brass or stainless-steel needle type.

Syphons: NPS 1/4 (DN8) coil of brass tubing with threaded ends.

Snubbers: ASME B40.5, NPS 1/4 (DN8) brass bushing with corrosion-resistant porous-metal disc of material suitable for system fluid and working pressure.

**TEST PLUGS:**

Description: Nickel-plated, brass-body test plug in NPS 1/2 (DN15) fitting.

Body: Length as required to extend beyond insulation.

Pressure Rating: 500 psig (3450 kPa) minimum.

Core Inserts: Two self-sealing valves, suitable for inserting 1/8-inch (3-mm) OD probe from dial-type thermometer or pressure gage.

Core Material for Air, Water, Oil, and Gas: 20 to 200 deg F (Minus 7 to plus 93 deg C), chlorosulfonated polyethylene synthetic rubber.

Test-Plug Cap: Gasketed and threaded cap, with retention chain or strap.

## PART 3 EXECUTION

### METER AND GAGE INSTALLATION, GENERAL:

Install meters, gages, and accessories according to manufacturer's written instructions for applications where used.

### THERMOMETER INSTALLATION:

Install thermometers and adjust vertical and tilted positions.

Install in the following locations:

A. Inlet and outlet of each hydronic boiler.

Install separable sockets in vertical position in piping tees where fixed thermometers are indicated.

A. Install with socket extending to center of pipe.
B. Fill sockets with oil or graphite.

Install thermometer wells in vertical position in piping tees where test thermometers are indicated.

A. Install with stem extending to center of pipe.
B. Fill wells with oil or graphite and secure caps.

### PRESSURE-GAGE INSTALLATION:

Install pressure gages in piping tees with pressure-gage valve located on pipe at most readable position.

Install dry-type pressure gages in the following locations:

A. Discharge of each pressure-reducing valve.

Install liquid-filled-type pressure gages at suction and discharge of each pump.

Install pressure-gage needle valve and snubber in piping to pressure gages.

Exception: Install syphon instead of snubber in piping to steam pressure gages.

### CONNECTIONS:

Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties. The following are specific connection requirements:

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance.
B. Connect flow-measuring-system elements to meters.
C. Connect flowmeter transmitters to meters.

Electrical Contractor to make connections to power supply and electrically operated meters and devices.

Ground electrically operated meters.

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.

Install electrical connections for power and devices.

Electrical power, wiring, and connections are specified in Division 26 Sections.

**ADJUSTING AND CLEANING:**

Calibrate meters according to manufacturer's written instructions, after installation.

Adjust faces of meters and gages to proper angle for best visibility.

Clean windows of meters and gages and clean factory-finished surfaces. Replace cracked and broken windows, and repair scratched and marred surfaces with manufacturer's touchup paint.

**END OF SECTION**

# 22 05 23 GENERAL-DUTY VALVES FOR PLUMBING PIPING

## PART 1 GENERAL

### RELATED DOCUMENTS:

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

### SUMMARY:

This Section includes general duty valves common to several mechanical piping systems.

Related Sections: The following Sections contain requirements that relate to this Section:

A. Special purpose valves are specified in Division 22 piping system Sections.
B. Valve tags and charts are specified in Division 23 Section "Mechanical Identification."

### SUBMITTALS:

General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

Product Data for each valve type. Include body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions. Include list indicating valve and its application.

Maintenance data for valves to include in the operation and maintenance manual specified in Division 1. Include detailed manufacturer's instructions on adjusting, servicing, disassembling, and repairing.

### QUALITY ASSURANCE:

Single-Source Responsibility: Comply with the requirements specified in Division 1 Section "Materials and Equipment," under "Source Limitations" Paragraph.

ASME Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.

MSS Compliance: Comply with the various MSS Standard Practice documents referenced.

### DELIVERY, STORAGE, AND HANDLING:

Prepare valves for shipping as follows:

A. Protect internal parts against rust and corrosion.
B. Protect threads, flange faces, grooves, and weld ends.
C. Set globe and gate valves closed to prevent rattling.
D. Set ball and plug valves open to minimize exposure of functional surfaces.
E. Set butterfly valves closed or slightly open.
F. Block check valves in either closed or open position.

Use the following precautions during storage:

A. Maintain valve end protection.
B. Store indoors and maintain valve temperature higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

Use a sling to handle large valves. Rig to avoid damage to exposed parts. Do not use handwheels and stems as lifting or rigging points.

## PART 2 PRODUCTS

**MANUFACTURERS:**

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

A. Ball Valves:
   1. Hammond Valve Corporation.
   2. Milwaukee Valve Company, Inc.
   3. NIBCO Inc.
   4. Stockham Valves & Fittings, Inc.
   5. Victaulic Company of America.
   6. Apollo.

B. Plug Valves:
   1. NIBCO Inc.
   2. Stockham Valves & Fittings, Inc.
   3. Victaulic Company of America.

C. Globe Valves:
   1. Hammond Valve Corporation.
   2. Milwaukee Valve Company, Inc.
   3. NIBCO Inc.
   4. Stockham Valves & Fittings, Inc.

D. Butterfly Valves:
   1. Center Line, Mark Controls Corporation.
   2. Hammond Valve Corporation.
   3. Keystone Valve USA, Inc.
   4. Milwaukee Valve Company, Inc.
   5. NIBCO Inc.
   6. Stockham Valves & Fittings, Inc.
   7. Victaulic Company of America.

E. Swing Check Valves:
   1. Hammond Valve Corporation.
   2. Milwaukee Valve Company, Inc.
   3. NIBCO Inc.
   4. Stockham Valves & Fittings, Inc.
   5. Victaulic Company of America.

**BASIC, COMMON FEATURES:**

Design: Rising stem or rising outside screw and yoke stems, except as specified below.

Nonrising stem valves may be used only where headroom prevents full extension of rising stems.

Pressure and Temperature Ratings: As indicated in the "Application Schedule" of Part 3 of this Section and as required to suit system pressures and temperatures.

Sizes: Same size as upstream pipe, unless otherwise indicated.

Operators: Use specified operators and handwheels, except provide the following special operator features:

A. Handwheels: For valves other than quarter turn.
B. Lever Handles: For quarter-turn valves 6 inches (DN150) and smaller, except for plug valves, which shall have square heads. Furnish Owner with 1 wrench for every 10 plug valves.
C. Chain-Wheel Operators: For valves 4 inches (DN100) and larger, installed 84 inches (2400 mm) or higher above finished floor elevation.
D. Gear-Drive Operators: For quarter-turn valves 8 inches (DN200) and larger.

Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.

Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.

Threads: ASME B1.20.1.

Flanges: ASME B16.1 for cast iron, ASME B16.5 for steel, and ASME B16.24 for bronze valves.

Solder Joint: ASME B16.18.

Caution: Where soldered end connections are used, use solder having a melting point below 840 deg F (450 deg C) for gate, globe, and check valves; below 421 deg F (216 deg C) for ball valves.

**BALL VALVES:**

Ball Valves, 4 Inches (DN100) and Smaller: MSS SP-110, Class 150, 600-psi (4140-kPa) CWP, ASTM B 584 bronze body and bonnet, 2-piece construction; chrome-plated brass ball, standard port for 1/2-inch (DN15) valves and smaller and full port for 3/4-inch (DN20) valves and larger; blowout proof; bronze or brass stem; teflon seats and seals; threaded or soldered end connections:

Operator: Vinyl-covered steel lever handle, unless noted otherwise.

**PLUG VALVES:**

Plug Valves: MSS SP-78, 175-psi (1200-kPa) CWP, ASTM A 126 cast-iron body and bonnet, cast-iron plug, Buna N, Viton, or teflon packing, flanged or grooved end connections:

Operator: Lever.

**GLOBE VALVES:**

Globe Valves, 2-1/2 Inches (DN65) and Smaller: MSS SP-80; Class 125, 200-psi (1380-kPa) CWP, or Class 150, 300-psi (2070-kPa) CWP; ASTM B 62 cast-bronze body and screwed bonnet, rubber, bronze, or teflon disc, silicon bronze-alloy stem, teflon-impregnated packing with bronze nut, threaded or soldered end connections; and with aluminum or malleable-iron handwheel.

Globe Valves, 3 Inches (DN80) and Larger: MSS SP-85, Class 125, 200-psi (1380-kPa) CWP, ASTM A 126 cast-iron body and bolted bonnet with bronze fittings, renewable bronze seat and disc, brass-alloy stem, outside screw and yoke, teflon-impregnated packing with cast-iron follower, flanged end connections; and with cast-iron handwheel.

**BUTTERFLY VALVES:**

Butterfly Valves: MSS SP-67, 200-psi (1380-kPa) CWP, 150-psi (1035- kPa) maximum pressure differential, ASTM A 126 cast-iron body and bonnet, extended neck, stainless-steel stem, field-replaceable EPDM or Buna N sleeve and stem seals, wafer, lug, or grooved style:

Disc Type: Aluminum bronze.

Operator for Sizes 2 Inches (DN50) to 6 Inches (DN150): Standard lever handle with memory stop.

Operator for Sizes 8 Inches (DN200) to 24 Inches (DN600): Gear operator with position indicator and chain wheel if operator is higher than 84" above floor.

**CHECK VALVES:**

Swing Check Valves, 2-1/2 Inches (DN65) and Smaller: MSS SP-80; Class 125, 200-psi (1380-kPa) CWP, or Class 150, 300-psi (2070-kPa) CWP; horizontal swing, Y-pattern, ASTM B 62 cast-bronze body and cap, rotating bronze disc with rubber seat or composition seat, threaded or soldered end connections, non-slam.

Swing Check Valves, 3 Inches (DN80) and Larger: MSS SP-71, Class 125, 200-psi (1380-kPa) CWP, ASTM A 126 cast-iron body and bolted cap, horizontal-swing bronze disc, flanged or grooved end connections, non-slam.

## PART 3 EXECUTION

**EXAMINATION:**

Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance of valves. Do not proceed with installation until unsatisfactory conditions have been corrected.

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.

Operate valves from fully open to fully closed positions. Examine guides and seats made accessible by such operation.

Examine threads on valve and mating pipe for form and cleanliness.

Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size, material composition suitable for service, and freedom from defects and damage.

Do not attempt to repair defective valves; replace with new valves.

**INSTALLATION:**

Install valves as indicated, according to manufacturer's written instructions.

Piping installation requirements are specified in other Division 22 Sections. Drawings indicate the general arrangement of piping, fittings, and specialties.

Install valves with unions or flanges at each piece of equipment arranged to allow servicing, maintenance, and equipment removal without system shutdown.

Locate valves for easy access and provide separate support where necessary.

Install valves in horizontal piping with stem at or above the center of the pipe.

Install valves in a position to allow full stem movement.

Install check valves for proper direction of flow as follows in a horizontal or vertical position with hinge pin level.

**SOLDERED CONNECTIONS:**

Cut tube square and to exact lengths.

Clean end of tube to depth of valve socket with steel wool, sand cloth, or a steel wire brush to a bright finish. Clean valve socket.

Apply proper soldering flux in an even coat to inside of valve socket and outside of tube.

Open gate and globe valves to fully open position.

Remove the cap and disc holder of swing check valves having composition discs.

Insert tube into valve socket, making sure the end rests against the shoulder inside valve. Rotate tube or valve slightly to ensure even distribution of the flux.

Apply heat evenly to outside of valve around joint until solder melts on contact. Feed solder until it completely fills the joint around tube. Avoid hot spots or overheating valve. Once the solder starts cooling, remove excess amounts around the joint with a cloth or brush.

**THREADED CONNECTIONS:**

Note the internal length of threads in valve ends and proximity of valve internal seat or wall to determine how far pipe should be threaded into valve.

Align threads at point of assembly.

Apply appropriate tape or thread compound to the external pipe threads, except where dry seal threading is specified.

Assemble joint, wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

**FLANGED CONNECTIONS:**

Align flange surfaces parallel.

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 with a torque wrench.

For dead-end service, butterfly valves require flanges both upstream and downstream for proper shutoff and retention.

**VALVE END SELECTION:**

Select valves with the following ends or types of pipe/tube connections:

A. Copper Tube Size, 2-1/2 Inches (DN65) and Smaller: Solder ends, except provide threaded ends for heating hot water and low-pressure steam service.
B. Steel Pipe Sizes, 2 Inches (DN65) and Smaller: Threaded or grooved end.
C. Steel Pipe Sizes, 2-1/2 Inches (DN80) and Larger: Grooved end or flanged.

**APPLICATION SCHEDULE:**

General Application: Use ball and butterfly valves for shutoff duty; globe, ball, and butterfly for throttling duty. Refer to piping system Specification Sections for specific valve applications and arrangements.

A. Domestic Water Systems: Use the following valve types:
    1. Ball Valves: Class 150, 600-psi (4140-kPa) CWP, with stem extension.
    2. Globe Valves: Class 125, bronze or cast-iron body to suit piping system, and bronze or teflon disc.
    3. Butterfly Valves: Nickel-plated ductile iron, aluminum bronze, or elastomer-coated ductile iron disc; EPDM or Buna N sleeve and stem seals.
    4. Bronze Swing Check: Class 125, with rubber seat.

**ADJUSTING:**

Adjust or replace packing after piping systems have been tested and put into service, but before final adjusting and balancing. Replace valves if leak persists.

**END OF SECTION**

# 22 05 29 HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

## PART 1 GENERAL

### RELATED DOCUMENTS:

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

### SUMMARY:

This Section includes hangers and supports for mechanical system piping and equipment.

### DEFINITIONS:

MSS: Manufacturers Standardization Society for the Valve and Fittings Industry.

Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

### PERFORMANCE REQUIREMENTS:

Design channel support systems for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

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

### SUBMITTALS:

Product Data: For each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated.

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.

Welding Certificates: Copies of certificates for welding procedures and operators.

### QUALITY ASSURANCE:

Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

Engineering Responsibility: Design and preparation of Shop Drawings and calculations for each multiple pipe support, trapeze, and seismic restraint by a qualified professional engineer.

A. 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

**MANUFACTURERS:**

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

A. Pipe Hangers:
   1. AAA Technology and Specialties Co., Inc.
   2. B-Line Systems, Inc.
   3. Erico.
   4. Globe Pipe Hanger Products, Inc.
   5. Grinnell Corp.
   6. GS Metals Corp.
   7. National Pipe Hanger Corp.
   8. PHD Manufacturing, Inc.
   9. PHS Industries, Inc.
   10. Piping Technology & Products, Inc.

B. Channel Support Systems:
   1. B-Line Systems, Inc.
   2. Erico.
   3. Grinnell Corp.; Power-Strut Unit.
   4. GS Metals Corp.
   5. National Pipe Hanger Corp.
   6. Thomas & Betts Corp.
   7. Unistrut Corp.

C. Thermal-Hanger Shield Inserts:
   1. PHS Industries, Inc.
   2. Pipe Shields, Inc.
   3. Rilco Manufacturing Co., Inc.
   4. Value Engineered Products, Inc.

D. Powder-Actuated Fastener Systems:
   1. Gunnebo Fastening Corp.
   2. Hilti, Inc.
   3. ITW Ramset/Red Head.
   4. Masterset Fastening Systems, Inc.

**MANUFACTURED UNITS:**

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.

A. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
B. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.

A. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
B. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

Thermal-Hanger Shield Inserts: 100-psi (690-kPa) minimum compressive-strength insulation, encased in sheet metal shield.

A. Material for Piping: ASTM C 552, Type I cellular glass or high density polyisocyanurate insulation.
B. For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.
C. For Clevis or Band Hanger: Insert and shield cover lower 180 degrees of pipe.
D. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield.

**MISCELLANEOUS MATERIALS:**

Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.

Grout: ASTM C 1107, Grade B, factory-mixed and -packaged, nonshrink and nonmetallic, dry, hydraulic-cement grout.

A. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
B. Properties: Nonstaining, noncorrosive, and nongaseous.
C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

## PART 3 EXECUTION

**HANGER AND SUPPORT APPLICATIONS:**

Specific hanger requirements are specified in Sections specifying equipment and systems.

Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.

**All hangers are to be sized to allow for continuous installation of insulation and thermal insulation shield. Hangers are to sized to match the O.D. of insulated pipes or O.D. of uninsulated pipes.**

Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

A. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN15 to DN750).
B. Adjustable Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8 (DN20 to DN200).

Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

A. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN20 to DN500).
B. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN20 to DN500), if longer ends are required for riser clamps.

Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

A. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
B. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
C. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
D. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
E. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.

Building Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

A. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
B. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
C. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
D. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
E. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
F. C-Clamps (MSS Type 23): For structural shapes.
G. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
H. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
I. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
J. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
K. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
L. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    1. Light (MSS Type 31): 750 lb (340 kg).
    2. Medium (MSS Type 32): 1500 lb (675 kg).
    3. Heavy (MSS Type 33): 3000 lb (1350 kg).

M. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
N. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
O. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where head room is limited.

Saddles and Shields: Unless otherwise indicated and except as specified in piping system

Specification Sections, install the following types:

A. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
B. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.
C. Thermal-Hanger Shield Inserts: For supporting insulated pipe, 360-degree insert of high-density, 100-psi (690-kPa) minimum compressive-strength, high density polyisocyanurate or cellular-glass pipe insulation, same thickness as adjoining insulation with vapor barrier and encased in 360-degree sheet metal shield.

**HANGER AND SUPPORT INSTALLATION:**

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.

Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems.

A. Field assemble and install according to manufacturer's written instructions.

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.

Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

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.

Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

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.

Insulated Piping: Comply with the following:

A. Attach clamps and spacers to piping.
    1. Use thermal-hanger shield insert with clamp sized to match OD of insert.
    2. Do not exceed pipe stress limits according to ASME B31.9.

B. Install MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
   1. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN100) and larger if pipe is installed on rollers.

C. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span arc of 180 degrees.
   1. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN100) and larger if pipe is installed on rollers.

D. Shield Dimensions for Pipe: Not less than the following:
   1. NPS 1/4 to NPS 3-1/2 (DN8 to DN90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
   2. NPS 4 (DN100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
   3. NPS 5 and NPS 6 (DN125 and DN150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
   4. NPS 8 to NPS 14 (DN200 to DN350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
   5. NPS 16 to NPS 24 (DN400 to DN600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.

E. Pipes NPS 8 (DN200) and Larger: Include wood inserts.
F. Insert Material: Length at least as long as protective shield.
G. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

**EQUIPMENT SUPPORTS:**

Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor.

Grouting: Place grout under supports for equipment and make smooth bearing surface.

**METAL FABRICATION:**

Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports.

Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.

Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

A. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
B. Obtain fusion without undercut or overlap.
C. Remove welding flux immediately.
D. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

**ADJUSTING:**

Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve

indicated slope of pipe.

**PAINTING:**

Touching Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

A. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9 Section "Painting."

Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

**END OF SECTION**

# 22 05 53 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

## PART 1 GENERAL

### RELATED DOCUMENTS:

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

### SUMMARY:

This Section includes mechanical identification materials and devices.

### SUBMITTALS:

Product Data: For identification materials and devices.

Valve Schedules: For each piping system. Reproduce on standard-size bond paper. Tabulate valve number, piping system, system abbreviation as shown on tag, room or space location of valve, and variations for identification. Mark valves intended for emergency shutoff and similar special uses. Besides mounted copies, furnish copies for maintenance manuals specified in Division 1.

### QUALITY ASSURANCE:

Comply with ASME A13.1, "Scheme for the Identification of Piping Systems" for lettering size, length of color field, colors, and viewing angles of identification devices.

### SEQUENCING AND SCHEDULING:

Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

Install identifying devices before installing acoustical ceilings and similar concealment.

## PART 2 PRODUCTS

### IDENTIFYING DEVICES AND LABELS:

General: Products specified are for applications referenced in other Division 15 Sections. If more than single type is specified for listed applications, selection is Installer's option.

Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.

A. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and essential data.
B. Location: Accessible and visible.

Snap-On Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap-on type. Include color-coding according to ASME A13.1, unless otherwise indicated.

Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, color-coded, pressure-

sensitive, vinyl type with permanent adhesive.

Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): Full-band pipe markers, extending 360 degrees around pipe at each location.

Pipes with OD, Including Insulation, 6 Inches (150 mm) and Larger: Either full-band or strip-type pipe markers, at least 3 times letter height and of length required for label.

Lettering: Manufacturer's standard preprinted captions as selected by Architect.

Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.

A. Arrows: Either integrally with piping system service lettering, to accommodate both directions, or as separate unit, on each pipe marker to indicate direction of flow.

Plastic Duct Markers: Manufacturer's standard laminated plastic, in the following color codes:

A. Green: Cold-air supply.
B. Yellow: Hot-air supply.
C. Blue: Exhaust, outside, return, and mixed air.
D. Hazardous Material Exhausts: Use colors and designs recommended by ASME A13.1.
E. Terminology: Include direction of airflow; duct service such as supply, return, and exhaust; duct origin, duct destination, and design flow.

Plastic Tape: Manufacturer's standard color-coded, pressure-sensitive, self-adhesive, vinyl tape, at least 3 mils (0.08 mm) thick.

A. Width: 1-1/2 inches (40 mm) on pipes with OD, including insulation, less than 6 inches (150 mm); 2-1/2 inches (65 mm) for larger pipes.
B. Color: Comply with ASME A13.1, unless otherwise indicated.

Valve Tags: Stamped or engraved with 1/4-inch (6-mm) letters for piping system abbreviation and 1/2-inch (13-mm) sequenced numbers. Include 5/32-inch (4-mm) hole for fastener.

A. Material: 0.032-inch- (0.8-mm-) thick, polished brass.
B. Size: 1-1/2-inches (40-mm) diameter, unless otherwise indicated.
C. Shape: As indicated for each piping system.

Valve Tag Fasteners: Brass, wire-link or beaded chain; or brass S-hooks.

Access Panel Markers: 1/16-inch- (2-mm-) thick, engraved plastic-laminate markers, with abbreviated terms and numbers corresponding to concealed valve. Provide 1/8-inch (3-mm) center hole for attachment.

Valve Schedule Frames: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include screws.

A. Frame: Extruded aluminum.
B. Glazing: ASTM C 1036, Type I, Class 1, Glazing quality B, 2.5-mm, single-thickness glass.

Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine

subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.

A. Engraving: Engraver's standard letter style, of sizes and with terms to match equipment identification.
B. Thickness: 1/16 inch (2 mm), for units up to 20 sq. in. (130 sq. cm) or 8 inches (200 mm) in length, and 1/8 inch (3 mm) for larger units.
C. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

Plastic Equipment Markers: Manufacturer's standard laminated plastic, in the following color codes:

A. Green: Cooling equipment and components.
B. Yellow: Heating equipment and components.
C. Brown: Energy reclamation equipment and components.
D. Blue: Equipment and components that do not meet criteria above.
E. Hazardous Equipment: Use colors and designs recommended by ASME A13.1.
F. Terminology: Match schedules as closely as possible. Include the following:
   1. Name and plan number.
   2. Equipment service.
   3. Design capacity.
   4. Other design parameters such as pressure drop, entering and leaving conditions, and speed.

G. Size: 2-1/2 by 4 inches (65 by 100 mm) for control devices, dampers, and valves; 4-1/2 by 6 inches (115 by 150 mm) for equipment.

Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification with corresponding designations indicated. Use numbers, letters, and terms indicated for proper identification, operation, and maintenance of mechanical systems and equipment.

A. Multiple Systems: Identify individual system number and service if multiple systems of same name are indicated.

## PART 3 EXECUTION

### LABELING AND IDENTIFYING PIPING SYSTEMS:

Install pipe markers on each system. Include arrows showing normal direction of flow.

Marker Type: Plastic markers, with application systems. Install on pipe insulation segment where required for hot, noninsulated pipes.

Fasten markers on pipes and insulated pipes smaller than 6 inches (150 mm) OD by one of following methods:

A. Snap-on application of pretensioned, semirigid plastic pipe marker.
B. Adhesive lap joint in pipe marker overlap.
C. Laminated or bonded application of pipe marker to pipe or insulation.
D. Taped to pipe or insulation with color-coded plastic adhesive tape, not less than 3/4 inch (20 mm) wide, lapped a minimum of 1-1/2 inches (40 mm) at both ends of pipe marker, and covering full circumference of pipe.

Fasten markers on pipes and insulated pipes 6 inches (150 mm) in diameter and larger by one of following methods:

A. Laminated or bonded application of pipe marker to pipe or insulation.
B. Taped to pipe or insulation with color-coded plastic adhesive tape, not less than 1-1/2 inches (40 mm) wide, lapped a minimum of 3 inches (75 mm) at both ends of pipe marker, and covering full circumference of pipe.
C. Strapped to pipe or insulation with manufacturer's standard stainless-steel bands.

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 according to the following:

A. Near each valve and control device.
B. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Mark each pipe at branch, where flow pattern is not obvious.
C. Near penetrations through walls, floors, ceilings, or nonaccessible enclosures.
D. At access doors, manholes, and similar access points that permit view of concealed piping.
E. Near major equipment items and other points of origination and termination.
F. Spaced at a maximum of 50-foot (15-m) intervals along each run. Reduce intervals to 25 feet (7.5 m) in areas of congested piping and equipment.
G. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

**VALVE TAGS:**

Install 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 valve schedule.

Valve Tag Application Schedule: Tag valves according to size, shape, color scheme, and with captions similar to those indicated in the following:

Tag Material: Brass.

Tag Size and Shape: According to the following:

A. Cold Water: 1-1/2 inches (40 mm), round.
B. Hot Water: 1-1/2 inches (40 mm), round.

Tag Color: According to the following:

A. Cold Water: Natural.
B. Hot Water: Natural.

Letter Color: According to the following:

A. Cold Water: Black.
B. Hot Water: Black.

Install mounted valve schedule in each major equipment room.

**EQUIPMENT SIGNS AND MARKERS:**

Install engraved plastic-laminate signs or equipment markers on or near each major item of mechanical equipment. Include signs for the following general categories of equipment:

A. Fuel-burning units, including boilers, furnaces, heaters, stills, and absorption units.
B. Pumps, compressors, chillers, condensers, and similar motor-driven units.
C. Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar equipment.
D. Tanks and pressure vessels.

**ADJUSTING AND CLEANING:**

Relocate mechanical identification materials and devices that have become visually blocked by work of this or other Divisions.

Clean faces of identification devices and glass frames of valve charts.

**END OF SECTION**

# 22 07 16 PLUMBING EQUIPMENT INSULATION

## PART 1 GENERAL

### RELATED DOCUMENTS:

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

### SUMMARY:

This Section includes blanket, board, and block insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

Related Sections include the following:

A. Division 22 Section "Pipe Insulation" for insulation for piping systems.

### SUBMITTALS:

Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

Shop Drawings: Show fabrication and installation details for the following:

A. Field application for each equipment type.
B. Removable insulation sections at access panels.
C. Application of field-applied jackets.
D. Special shapes for cellular-glass insulation.

Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.

Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

### QUALITY ASSURANCE:

Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.

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.

A. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
A. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

### DELIVERY, STORAGE, AND HANDLING:

Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

**COORDINATION:**

Coordinate clearance requirements with equipment Installer for insulation application.

## PART 2 PRODUCTS

**MANUFACTURERS**

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

A. Mineral-Fiber Insulation:
   1. CertainTeed Manson.
   2. Knauf FiberGlass GmbH.
   3. Owens-Corning Fiberglas Corp.
   4. Johns Manville.

B. Flexible Elastomeric Thermal Insulation:
   1. Armstrong World Industries, Inc.
   2. Rubatex Corp.

**INSULATION MATERIALS:**

Mineral-Fiber Board Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IB, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type II for sheet materials.

A. Adhesive: As recommended by insulation material manufacturer.
B. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.

**FIELD-APPLIED JACKETS:**

General: ASTM C 921, Type 1, unless otherwise indicated.

Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

PVC Jacket: High-impact, ultraviolet-resistant PVC; 20 mils (0.5 mm) thick; roll stock ready for shop or field cutting and forming.

A. Adhesive: As recommended by insulation material manufacturer.
B. PVC Jacket Color: White or gray.

**ACCESSORIES AND ATTACHMENTS:**

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).

A. Tape Width: 4 inches (100 mm).

Bands: 3/4 inch (19 mm) wide, in one of the following materials compatible with jacket:

A. Stainless Steel: ASTM A 666, Type 304; 0.020 inch (0.5 mm) thick.
B. Galvanized Steel: 0.005 inch (0.13 mm) thick.
C. Aluminum: 0.007 inch (0.18 mm) thick.

Wire: 0.080-inch (2.0-mm), nickel-copper alloy; 0.062-inch (1.6-mm), soft-annealed, stainless steel; or 0.062-inch (1.6-mm), soft-annealed, galvanized steel.

Weld-Attached Anchor Pins and Washers: Copper-coated steel pin for capacitor-discharge welding and galvanized speed washer. Pin length sufficient for insulation thickness indicated.

A. Welded Pin Holding Capacity: 100 lb (45 kg) for direct pull perpendicular to the attached surface.

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.

A. 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.

Self-Adhesive 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.

**VAPOR RETARDERS:**

Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

## PART 3 EXECUTION

**EXAMINATION:**

Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

Proceed with installation only after unsatisfactory conditions have been corrected.

**PREPARATION:**

Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

**GENERAL APPLICATION REQUIREMENTS:**

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 equipment.

Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each equipment system.

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 the wet or dry state.

Apply multiple layers of insulation with longitudinal and end seams staggered.

Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

Keep insulation materials dry during application and finishing.

Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

Apply insulation with the least number of joints practical.

Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

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.

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.

Apply insulation with integral jackets as follows:

A. Pull jacket tight and smooth.
B. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
C. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges and fittings.

Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.

Install vapor-retarder mastic on equipment scheduled to receive 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.

Insulate the following indoor equipment:

A. Domestic hot-water storage tanks, not factory insulated.

Omit insulation from the following:

A. Vibration-control devices.
B. Testing agency labels and stamps.
C. Nameplates and data plates.
D. Manholes.
E. Handholes.
F. Cleanouts.

**INDOOR TANK AND VESSEL INSULATION APPLICATION:**

Blankets, Board, and Block Applications for Tanks and Vessels: Secure insulation with adhesive and anchor pins and speed washers.

A. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of tank and vessel surfaces.
B. Groove and score insulation materials to fit as closely as possible to the equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joint. Stagger end joints.
C. Protect exposed corners with secured corner angles.
D. Install adhesive-attached or self-adhesive anchor pins and speed washers on sides of tanks and vessels as follows:
    1. Do not weld anchor pins to ASME-labeled pressure vessels.
    2. On tank and vessel, 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c. in both directions.
    3. Do not overcompress insulation during installation.
    4. Cut and miter insulation segments to fit curved sides and dome heads of tanks and vessels.
E. Impale insulation over anchor pins and attach speed washers.
F. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing
G. Secure each layer of insulation with stainless-steel bands.
H. Stagger joints between insulation layers at least 3 inches (75 mm).
I. Apply insulation in removable segments on equipment access doors and other elements that require frequent removal for service.
J. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
K. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

Flexible Elastomeric Thermal Insulation Applications for Tanks and Vessels: Apply insulation over entire surface of tanks and vessels according to the manufacturer's written instructions.

A. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.
B. Seal longitudinal seams and end joints.

**FIELD-APPLIED JACKET APPLICATION:**

Apply glass-cloth jacket where indicated, directly over bare insulation or insulation with factory-applied jackets.

A. Apply jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
B. Embed glass cloth between two 0.062-inch- (1.6-mm-) thick coats of jacket manufacturer's recommended adhesive.
C. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

Foil and Paper Jackets: Apply foil and paper jackets where indicated.

A. Draw jacket material smooth and tight.
B. Apply lap or joint strips with the same material as jacket.
C. Secure jacket to insulation with manufacturer's recommended adhesive.
D. Apply jackets with 1-1/2-inch (40-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
E. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-retarder mastic.

PVC Jackets: Apply jacket with longitudinal seams along top and bottom of tanks and vessels for horizontal applications. Secure and seal seams and end joints with manufacturer's welding adhesive.

A. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along the seam and joint edge.

**FINISHES:**

Glass-Cloth Jacketed Insulation: Paint insulation finished with glass-cloth jacket as specified in Division 9 Section "Painting."

Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

**FIELD QUALITY CONTROL:**

Insulation applications will be considered defective if sample inspection reveals noncompliance with requirements. Remove defective Work and replace with new materials according to these Specifications.

Reinstall insulation and covers on pumps and tanks uncovered for inspection according to these Specifications.

**EQUIPMENT APPLICATIONS:**

Insulation materials and thicknesses are specified in schedules at the end of this Section.

Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.

**INTERIOR TANK AND VESSEL INSULATION APPLICATION SCHEDULE:**

Equipment: Heating hot-water air separators and compression tanks.

A. Operating Temperature: 100 to 200 deg F (38 to 93 deg C).
B. Insulation Material: Mineral fiber or flexible elastomeric.
C. Insulation Thickness: 1-1/2 inch.
D. Field-Applied Jacket: Foil and paper – mineral fiber.
E. Vapor Retarder Required: Yes.
F. Finish: Painted – flexible elastomeric.

**END OF SECTION**

# 22 07 19 PLUMBING PIPING INSULATION

## PART 1 GENERAL

### RELATED DOCUMENTS:

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

### SUMMARY:

This Section includes preformed, rigid and flexible pipe insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

Related Sections include the following:

A. Division 7 Section "Firestopping" for firestopping materials and requirements for penetrations through fire and smoke barriers.
B. Division 22 Section "Equipment Insulation" for insulation materials and application for pumps, tanks, hydronic specialties, and other equipment.
C. Division 22 Section "Hangers and Supports" for pipe insulation shields and protection saddles.

### SUBMITTALS:

Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

Shop Drawings: Show fabrication and installation details for the following:

A. Application of protective shields, saddles, and inserts at pipe hangers for each type of insulation and hanger.
B. Attachment and covering of heat trace inside insulation.
C. Insulation application at pipe expansion joints for each type of insulation.
D. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
E. Removable insulation at piping specialties and equipment connections.
F. Application of field-applied jackets.

Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.

Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

### QUALITY ASSURANCE:

Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.

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.

A. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.

**DELIVERY, STORAGE, AND HANDLING:**

Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

**COORDINATION:**

Coordinate size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports."

Coordinate clearance requirements with piping Installer for insulation application.

**SCHEDULING:**

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

**MANUFACTURERS:**

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

A. Mineral-Fiber Insulation:
   1. CertainTeed Manson.
   2. Knauf FiberGlass GmbH.
   3. Owens-Corning Fiberglas Corp.
   4. John Manville.

**INSULATION MATERIALS:**

Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:

A. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket.
B. Blanket Insulation: Comply with ASTM C 553, Type II, without facing.
C. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:
   1. 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.
   2. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.

D. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.
E. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.
F. Expanded or Exfoliated Vermiculite Insulating Cements: Comply with ASTM C 196.

G. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

**FIELD-APPLIED JACKETS:**

General: ASTM C 921, Type 1, unless otherwise indicated.

Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

**ACCESSORIES AND ATTACHMENTS:**

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).

A. Tape Width: 4 inches (100 mm).

Bands: 3/4 inch (19 mm) wide, in one of the following materials compatible with jacket:

A. Stainless Steel: ASTM A 666, Type 304; 0.020 inch (0.5 mm) thick.
B. Galvanized Steel: 0.005 inch (0.13 mm) thick.
C. Aluminum: 0.007 inch (0.18 mm) thick.

Wire: 0.080-inch (2.0-mm), nickel-copper alloy; 0.062-inch (1.6-mm), soft-annealed, stainless steel; or 0.062-inch (1.6-mm), soft-annealed, galvanized steel.

**VAPOR RETARDERS:**

Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

## PART 3 EXECUTION

**EXAMINATION:**

Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

Proceed with installation only after unsatisfactory conditions have been corrected.

**PREPARATION:**

Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

**GENERAL APPLICATION REQUIREMENTS:**

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.

Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.

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.

Apply insulation with longitudinal seams at top and bottom of horizontal pipe runs.

Apply multiple layers of insulation with longitudinal and end seams staggered.

Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

Keep insulation materials dry during application and finishing.

Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

Apply insulation with the least number of joints practical.

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.

Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.

A. Apply insulation continuously through hangers and around anchor attachments.
B. 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.
C. 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.
D. 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.

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.

Apply adhesives and mastics at the manufacturer's recommended coverage rate.

Apply insulation with integral jackets as follows:

A. Pull jacket tight and smooth.
B. 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.
C. 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.
    1. Exception: Do not staple longitudinal laps on insulation having a vapor retarder.

D. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.
E. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.

Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.

Fire-Rated Wall and Partition Penetrations: Apply insulation continuously through penetrations of fire-rated walls and partitions.

A. Firestopping and fire-resistive joint sealers are specified in Division 7 Section "Firestopping."

Floor Penetrations: Apply insulation continuously through floor assembly.

A. For insulation with vapor retarders, seal insulation with vapor-retarder mastic where floor supports penetrate vapor retarder.

**MINERAL-FIBER INSULATION APPLICATION:**

Apply insulation to straight pipes and tubes as follows:

A. Secure each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.
B. 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.
C. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
D. 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.

Apply insulation to flanges as follows:

A. Apply preformed pipe insulation to outer diameter of pipe flange.
B. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
C. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
D. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.

Apply insulation to fittings and elbows as follows:

A. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
B. 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.
C. Cover fittings with standard PVC fitting covers.

Apply insulation to valves and specialties as follows:

A. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
B. When premolded insulation sections are not available, apply 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 stainer basket without disturbing insulation.
C. Apply insulation to flanges as specified for flange insulation application.
D. 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.
E. 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.
F. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

**FIELD-APPLIED JACKET APPLICATION:**

Apply glass-cloth jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.

A. Apply jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
B. Embed glass cloth between two 0.062-inch- (1.6-mm-) thick coats of jacket manufacturer's recommended adhesive.
C. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

Foil and Paper Jackets: Apply foil and paper jackets where indicated.

A. Draw jacket material smooth and tight.
B. Apply lap or joint strips with the same material as jacket.
C. Secure jacket to insulation with manufacturer's recommended adhesive.
D. Apply jackets with 1-1/2-inch (40-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
E. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-retarder mastic.

Apply PVC jacket on exposed piping in finished spaces, with 1-inch (25-mm) overlap at longitudinal seams and end joints, except for mechanical rooms. Seal with manufacturer's recommended adhesive.

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.

**PIPING SYSTEM APPLICATIONS:**

Insulation materials and thicknesses are specified in schedules at the end of this Section.

Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:

A. Flexible connectors.
B. Vibration-control devices.

C. Fire-suppression piping.
D. Drainage piping located in crawl spaces, unless otherwise indicated.
E. Below-grade piping, unless otherwise indicated.
F. Chrome-plated pipes and fittings, unless potential for personnel injury.
G. Air chambers, unions, strainers, check valves, plug valves, and flow regulators.

**FIELD QUALITY CONTROL:**

Insulation applications will be considered defective if sample inspection reveals noncompliance with requirements. Remove defective Work and replace with new materials according to these Specifications.

Reinstall insulation and covers on fittings and valves uncovered for inspection according to these Specifications.

**INSULATION APPLICATION SCHEDULE, GENERAL:**

Refer to insulation application schedules for required insulation materials, vapor retarders, and field-applied jackets.

Application schedules identify piping system and indicate pipe size ranges and material, thickness, and jacket requirements.

**INTERIOR INSULATION APPLICATION SCHEDULE:**

Service: Domestic cold (potable and non-potable), hot and re-circulated hot water.

A. Operating Temperature: 60 to 140 deg F (15 to 60 deg C).
B. Insulation Material: Mineral fiber.
C. Insulation Thickness: 1 inch.
D. Field-Applied Jacket: PVC in exposed finished rooms up to 12 feet above finished floor.
E. Vapor Retarder Required: Yes.
F. Finish: None.

**END OF SECTION**

## 22 11 16 DOMESTIC WATER PIPING

### PART 1 GENERAL

**RELATED DOCUMENTS**

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

**SUMMARY:**

This Section includes water distribution piping from locations indicated to fixtures and equipment inside building.

Related Sections include the following:

A. Division 33 Section "Water Systems" for exterior water service piping.
B. Division 33 Section "Water Systems" for exterior water service piping and water meters.
C. Division 22 Section "Meters and Gages" for water meters, thermometers, pressure gages, and fittings.
D. Division 22 Section "Meters and Gages" for thermometers, pressure gages, and fittings.
E. Division 22 Section "Plumbing Specialties" for water distribution piping specialties.

**DEFINITIONS:**

Water Distribution Piping: Water piping inside building that conveys water to fixtures and equipment throughout the building.

The following are industry abbreviations for plastic piping materials:

A. CPVC: Chlorinated polyvinyl chloride.
B. NP: Nylon.
C. PB: Polybutylene.
D. PE: Polyethylene.
E. PP: Polypropylene.
F. PVC: Polyvinyl chloride.

**SYSTEM PERFORMANCE REQUIREMENTS:**

Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:

A. Water Distribution Piping: 125 psig (860 kPa).

**SUBMITTALS:**

Water Samples, Test Results, and Reports: Specified in "Field Quality Control" and "Cleaning" articles.

Grooved Joint Couplings and Fittings: Shall be shown on drawings and product submittals, and shall be specifically identified with the applicable style or series designation.

**QUALITY ASSURANCE:**

Provide listing/approval stamp, label, or other marking on piping made to specified standards.

Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic potable-water piping components. Include marking "NSF-pw" on plastic potable-water piping.

Comply with NSF 61, "Drinking Water System Components--Health Effects," Sections 1 through 9 for potable-water piping and components.

All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

A. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.

## PART 2 PRODUCTS

**PIPES AND TUBES:**

General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.

Hard Copper Tube: ASTM B 88, Types L (ASTM B 88M, Type B), water tube, drawn temper.

**PIPE AND TUBE FITTINGS:**

General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.

Copper, Solder-Joint Pressure Fittings: ASME B16.18 cast-copper alloy or ASME B16.22 wrought copper.

Copper, Grooved-End Fittings: ASME B16.22 wrought copper and ASTM B 75 (ASTM B 75M) copper tube or ASME B16.18 cast-copper alloy and ASTM B 584 bronze castings. Copper-tubing sized grooved ends (flaring ends to accommodate alternate sized couplings is not permitted).

Copper, Push-to-Connect Pressure Fittings: ASME B16.18 cast-copper alloy or ASME B16.22 wrought copper, with 301 stainless steel internal components and EPDM seals.

Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.

Copper Unions: ASME B16.18, cast-copper-alloy, hexagonal-stock body with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends. Include threads conforming to ASME B1.20.1 on threaded ends.

**JOINING MATERIALS:**

General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.

Refer to Division 22 Section "Basic Mechanical Materials and Methods" for commonly used joining materials.

Solder: ASTM B 32, Alloy Sn95, Sn94, or E; lead free.

Brazing Filler Metal: AWS A5.8, BCuP, copper phosphorus or BAg, silver classification.

Transition Couplings: Coupling or other manufactured fitting same size as, with pressure rating at least equal to, and with ends compatible with piping to be joined.

Grooved Joint Lubricants: Lubricate gaskets in accordance with the manufacturer's recommendations with lubricant supplied by the coupling manufacturer that is suitable for the gasket elastomer and system media. Victaulic 'Vic-Lube'.

A. Gaskets shall be UL classified in accordance with ANSI/NSF-61 for Potable water service.

**VALVES:**

Refer to Division 22 Section "Valves" for general-duty valves.

Refer to Division 22 Section "Plumbing Specialties" for special-duty valves.

## PART 3 EXECUTION

**PIPING APPLICATIONS:**

Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.

Flanges may be used on aboveground piping, unless otherwise indicated.

Aboveground, Water Distribution Piping: Use the following:

A. 1-1/2" NPS (DN40) and Smaller: Hard copper tube, Type L (Type B); copper, solder-joint fittings; and soldered joints.
B. 1-1/2" NPS (DN40) and Smaller: Hard copper tube, Type L (Type B); copper, press-to-connect fittings and joints.
C. 2" through 3-1/2" NPS (DN50 to DN90): Hard copper tube, Type L (Type B); copper, solder-joint fittings, and soldered joints or with grooved ends, copper, grooved-end fittings and copper keyed couplings.
D. 4" to 8" NPS (DN100 to DN200): Hard copper tube, Type L (Type B) with grooved ends; copper, grooved-end fittings; and copper, keyed couplings.

**VALVE APPLICATIONS:**

Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

A. Shutoff Duty: Use ball or butterfly valves.
B. Throttling Duty: Use ball or butterfly valves.

Grooved-end butterfly valves may be used with grooved-end piping.

Plastic gate, globe, ball, butterfly, and check valves may be used with plastic pipe.

**PIPING INSTALLATION, GENERAL:**

Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.

**WATER DISTRIBUTION PIPING INSTALLATION:**

Install piping level without pitch.

**JOINT CONSTRUCTION:**

Refer to Division 22 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

Grooved Joints: Assemble joints with coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions. The grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the jobsite and review contractor is following best recommended practices in grooved product installation. (A distributor's representative is not considered qualified to conduct the training or jobsite visit(s).)

Press-to-Connect Joints: Install Permalynx joints in accordance with the manufacturer's latest published installation instructions. Prepare and mark tubing ends using a tool supplied by the manufacturer and in accordance with the manufacturer's instructions.

**VALVE INSTALLATION:**

Sectional Valves: Install sectional valves close to main on each branch and riser serving plumbing fixtures or equipment, and where indicated. Use ball valves for piping 2" NPS (DN50) and smaller. Use gate or butterfly valves for piping 2-1/2" NPS (DN65) and larger.

Shutoff Valves: Install shutoff valve on each water supply to equipment, on each supply to plumbing fixtures without supply stops, at all main fixture groups, branch lines off main, and where indicated. Use ball valves for piping 2" NPS (DN50) and smaller. Use gate or butterfly valves for piping 2-1/2" NPS (DN65) and larger.

Drain Valves: Install hose-end drain valves for equipment, at base of each water riser, at low points in horizontal piping, and where required to drain water piping.

Balancing Valves: Install in each hot-water circulation return branch, discharge side of each pump and circulator, and where indicated. Refer to Division 15 Section "Plumbing Specialties" for balancing valves.

**HANGER AND SUPPORT INSTALLATION**

Refer to Division 22 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:

A. Riser clamps, MSS Type 8 or Type 42, for vertical runs.
B. Adjustable steel clevis hangers, MSS Type 1, for individual, straight, horizontal runs 100 feet (30 m) and less.

Install supports according to Division 22 Section "Hangers and Supports."

Support vertical piping and tubing at base and at each floor.

Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

Install hangers for copper tubing, steel, and ductile iron with the following maximum spacing:

A. 1-1/2" NPS (DN40) and Smaller: Maximum horizontal spacing, 60 inches (1500 mm); maximum vertical spacing, 10 feet (3 m).
B. 2" through 2-1/2" NPS (DN50 to DN65): Maximum horizontal spacing, 72 inches (1800 mm); maximum vertical spacing, 10 feet (3 m).
C. 3" NPS (DN80) and Larger: Maximum horizontal spacing, 10 feet (3 m); maximum vertical spacing, 10 feet (3 m).

Minimum rod size to be according to manufacturer’s written instructions for service conditions base on maximum hanger spacing.

Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

**CONNECTIONS:**

Connect service entrance piping to exterior water service piping. Use transition fitting to join dissimilar piping materials.

Connect water distribution piping to service entrance piping at shutoff valve, and extend to and connect to the following:

A. Plumbing Fixtures: Connect hot- and cold-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22 Section "Plumbing Fixtures."
B. Equipment: Connect hot- and cold-water supply piping as indicated. Provide shutoff valve and union for each connection. Use flanges instead of unions for connections 2-1/2" NPS (DN65) and larger.
C. Water Heaters: Connect cold water supply and hot water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.

**FIELD QUALITY CONTROL:**

Inspect water distribution piping as follows:

Inspect water distribution piping as follows:

A. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
B. 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.

C. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

D. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

Test water distribution piping as follows:

A. 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.
B. Leave uncovered and unconcealed new, altered, extended, or replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
C. 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 12 hours. Leaks and loss in test pressure constitute defects that must be repaired.
D. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
E. Prepare reports for tests and required corrective action.

**CLEANING:**

Clean and disinfect service entrance piping and water distribution piping as follows:

A. Purge new piping and parts of existing water piping that have been altered, extended, or repaired before using.
B. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed, procedure described in either AWWA C651 or AWWA C652 or as described below:
    1. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    2. Fill and isolate system according to either of the following:
        a. 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.
        b. 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 3 hours.
    3. Flush system with clean, potable water until chlorine is no longer in water coming from system after the standing time.
    4. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows contamination.

Prepare and submit reports for purging and disinfecting activities.

Clean interior of piping system. Remove dirt and debris as work progresses.

**COMMISSIONING:**

Fill water piping. Check components to determine that they are not air bound and that piping is full of water.

Perform the following steps before putting into operation:

A. Close drain valves, hydrants, and hose bibbs.
B. Open shutoff valves to fully open position.
C. Open throttling valves to proper setting.
D. Remove plugs used during testing of piping and plugs used for temporary sealing of piping

during installation.

E. Remove and clean strainer screens. Close drain valves and replace drain plugs.
F. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and that cartridges are clean and ready for use.

Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.

Check plumbing specialties and verify proper settings, adjustments, and operation.

A. Water-Pressure Regulators: Set outlet pressure at 80 psig (550 kPa) maximum, unless otherwise indicated.

Energize pumps and verify proper operation.

**END OF SECTION**

# 22 11 19 DOMESTIC WATER PIPING SPECIALTIES

## PART 1 GENERAL

### RELATED DOCUMENTS

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

### SUMMARY

This Section includes plumbing specialties for the following:

A. Water distribution systems.

Related Sections include the following:

A. Division 22 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, basic installation requirements, and labeling and identifying requirements; and escutcheons, dielectric fittings, sleeves, and sleeve seals that are not in this Section.
B. Division 22 Section "Valves" for general-duty ball, butterfly, check, gate, and globe valves.
C. Division 22 Section "Meters and Gages" for thermometers, pressure gages, fittings, and water meters.
D. Division 22 Section "Water Distribution Piping" for water-supply piping and connections.

### SYSTEM PERFORMANCE REQUIREMENTS

Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:

A. Water Distribution Piping: 125 psig (860 kPa).

### SUBMITTALS

Product Data: For each plumbing specialty indicated. Include rated capacities of selected equipment 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 plumbing specialty products:

A. Balancing valves.
B. Strainers.
C. Drain valves.
D. Hose bibbs, hydrants, and sanitary post hydrants.

Reports: Specified in "Field Quality Control" Article.

### QUALITY ASSURANCE

Product Options: Drawings indicate size, profiles, dimensional requirements, and characteristics of plumbing specialties and are based on the specific types and models indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

Provide listing/approval stamp, label, or other marking on plumbing specialties made to specified standards.

Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

Comply with NFPA 70, "National Electrical Code," for electrical components.

Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic potable-water piping components. Include marking "NSF-pw" on plastic potable-water piping and "NSF-dwv" on plastic drain, waste, and vent piping.

## PART 2 PRODUCTS

### MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

A. Calibrated Balancing Valves:
   1. Armstrong Pumps, Inc.
   2. Flow Design, Inc.
   3. ITT Fluid Technology Corp.; ITT Bell & Gossett Div.
   4. Taco, Inc.
   5. Tour & Andersson, Inc.; Valve Div.

B. Hydrants:
   1. Josam Co.
   2. Prier Products Inc.
   3. Smith: Jay R. Smith Mfg. Co.
   4. Watts Industries, Inc.; Water Products Div.
   5. Woodford Manufacturing Co.
   6. Zurn Industries, Inc.; Hydromechanics Div.

### BALANCING VALVES

Calibrated Balancing Valves: Adjustable, with 2 readout ports and memory setting indicator. Include manufacturer's standard hoses, fittings, valves, differential pressure meter, and carrying case.

A. 2-Inch NPS (DN50) and Smaller: Bronze body with brass ball, adjustment knob, calibrated nameplate, and threaded or solder-joint ends.
B. 2-Inch NPS (DN50) and Smaller: Bronze, Y-pattern body with adjustment knob and threaded ends.
C. 2-1/2-Inch NPS (DN65) and Larger: Cast-iron, Y-pattern body with bronze disc and flanged or grooved ends.

### STRAINERS

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.

A. Pressure Rating: 125-psig (860-kPa) minimum steam working pressure, unless otherwise indicated.

B. 2-Inch NPS (DN50) and Smaller: Bronze body, with female threaded ends.
C. 2-1/2-Inch NPS (DN65) and Larger: Cast-iron body, with interior AWWA C550 or FDA-approved epoxy coating and flanged ends.
D. Y-Pattern Strainers: Screwed screen retainer with centered blowdown.
   1. Drain: Factory- or field-installed, hose-end drain valve.

E. T-Pattern Strainers: Malleable-iron or ductile-iron body with grooved ends; access end cap with drain plug and access coupling with rubber gasket.
F. Basket Strainers: Bolted flange or clamp cover, and basket with lift-out handle.
   1. Simplex Type: Single unit, with one basket.
   2. Duplex Type: Double unit, with bronze or stainless-steel diverter valve and 2 baskets.
   3. Drain: Factory- or field-installed, hose-end drain valve.

**DRAIN VALVES**

Hose-End Drain Valves: MSS SP-110, 3/4-inch NPS (DN20) ball valve, rated for 400-psig (2760-kPa) minimum CWP. Include 2-piece, ASTM B 62 bronze body with standard port, chrome-plated brass ball, replaceable seats and seals, blowout-proof stem, and vinyl-covered steel handle.

A. Inlet: Threaded or solder joint.
B. Outlet: Short-threaded nipple with ASME B1.20.7 garden-hose thread and cap.

**MISCELLANEOUS PIPING SPECIALTIES**

## PART 3 EXECUTION

**PLUMBING SPECIALTY INSTALLATION**

General: Install plumbing specialty components, connections, and devices according to manufacturer's written instructions.

Install strainers on supply side of each control valve, pressure regulator, and solenoid valve, and where indicated.

Install hose bibbs with integral or field-installed vacuum breaker.

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.

Fasten recessed, wall-mounting plumbing specialties to reinforcement built into walls.

Secure supplies to supports or substrate.

Install individual stop valve in each water supply to plumbing specialties. Use ball or globe valve if specific valve is not indicated.

Install water-supply stop valves in accessible locations.

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.

**CONNECTIONS**

Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

A. Install piping connections between plumbing specialties and piping specified in other Division 22 Sections.
B. Install piping connections indicated between appliances and equipment specified in other Sections; connect directly to plumbing piping systems.
C. Install piping connections indicated as indirect wastes from appliances and equipment specified in other Sections, to spill over receptors connected to plumbing piping systems.

Arrange for electric-power connections to plumbing specialties and devices that require power. Electric power is specified in Division 26 Sections.

Supply Runouts to Plumbing Specialties: Install hot- and cold-water-supply piping of sizes indicated, but not smaller than required by authorities having jurisdiction.

Ground electric-powered plumbing specialties.

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

Arrange for electric-power connections to plumbing specialties and devices that require power. Electric power, wiring, and disconnect switches are specified in Division 26 Sections.

**FIELD QUALITY CONTROL**

Manufacturer's Field Service: Provide services of factory-authorized service representative to supervise the field assembly of components and installation of grease recovery units, including piping and electrical connections, and to report results in writing.

A. Test and adjust plumbing specialty controls and safeties. Replace damaged and malfunctioning controls and components.

**COMMISSIONING**

Before startup, perform the following checks:

A. System tests are complete.
B. Damaged and defective specialties and accessories have been replaced or repaired.
C. Clear space is provided for servicing specialties.

Before operating systems, perform the following steps:

A. Close drain valves, hydrants, and hose bibbs.
B. Open general-duty valves to fully open position.
C. Remove and clean strainers.
D. Verify that drainage and vent piping are clear of obstructions. Flush with water until clear.

Startup Procedures: Follow manufacturer's written instructions. If no procedures are prescribed by manufacturer, proceed as follows:

A. Energize circuits for electrically operated units. Start and run units through complete sequence of operations.

Adjust operation and correct deficiencies discovered during commissioning.

**DEMONSTRATION**

Startup Services: Engage a factory-authorized service representative to perform startup services and train Owner's maintenance personnel as specified below:

A. Train Owner's maintenance personnel on procedures and schedules related to startup of and servicing interceptors.
B. Train Owner's maintenance personnel on procedures and schedules related to startup of and servicing grease recovery units.
C. Review data in the maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
D. Schedule training with Owner with at least 7 days' advance notice.

**PROTECTION**

Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

A. Place plugs in ends of uncompleted piping at end of each day or when work stops.

**END OF SECTION**

# 22 11 23 DOMESTIC WATER PUMPS

## PART 1 GENERAL

### RELATED DOCUMENTS:

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

### SUMMARY:

This Section includes pumps for the building potable-water systems.

Related Sections include the following:

A. Division 22 Section "HVAC Pumps" for hydronic system pumps.
B. Division 26 Sections for power-supply wiring, field-installed disconnects, electrical devices, and motor controllers.

### SUBMITTALS:

Product Data: Include certified performance curves and rated capacities of selected models; shipping, installed, and operating weights; furnished specialties; and accessories for each type and size of pump specified. Indicate pumps' operating point on curves.

A. Shop Drawings: Show layout and connections for pumps. Include setting drawings with templates, directions for installation of foundation and anchor bolts, and other anchorages.
   1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.

B. Maintenance Data: For each pump specified to include in maintenance manuals specified in Division 1.

### QUALITY ASSURANCE:

Source Limitations: Obtain same type of pumps through one source from a single manufacturer.

Product Options: Drawings indicate size, profiles, connections, and dimensional requirements of pumps and are based on specific manufacturer types and models indicated. Other manufacturers' pumps with equal performance characteristics may be considered.

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

### DELIVERY, STORAGE, AND HANDLING:

Retain shipping flange protective covers and protective coatings during storage.

Protect bearings and couplings against damage.

## PART 2 PRODUCTS

**MANUFACTURERS:**

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

A. Compact Circulators:
   1. Armstrong Pumps, Inc.
   2. Grundfos Pumps Corp.
   3. ITT Bell & Gossett Div.
   4. Taco, Inc.

B. In-Line Circulators:
   1. Armstrong Pumps, Inc.
   2. Grudfos Pumps Corp.
   3. ITT Bell & Gossett Div.
   4. Taco, Inc.

**PUMPS, GENERAL:**

Description: Factory-assembled and -tested, single-stage, centrifugal pump units; complying with UL 778; suitable for potable-water service; with all-bronze or stainless-steel construction and components in contact with water made of corrosion-resistant materials.

Motors: Comply with requirements in Division 15 Section "Motors" with built-in thermal-overload protection appropriate for motor size and duty.

End Connections for NPS 2 (DN50) and Smaller: Threaded. Pumps available only with flanged ends may be furnished with threaded companion flanges.

End Connections for NPS 2-1/2 (DN65) and Larger: Flanged.

Finish: Manufacturer's standard paint applied to factory-assembled and -tested units before shipping.

Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles.

**COMPACT CIRCULATORS**

Description: Horizontal, in-line, replaceable-cartridge-design circulator; rated for 125-psig 860-kPa minimum working pressure and minimum continuous water temperature of 225 deg F (107 deg C).

A. Pump and Motor Assembly: On common shaft in hermetically sealed unit without stuffing box or mechanical seal, and with manufacturer's standard cooling and lubrication system.
B. Impeller: Corrosion-resistant material.
C. Motor: Single speed, unless otherwise indicated.

**IN-LINE CIRCULATORS**

Description: Horizontal in-line circulator, rated for 125-psig860-kPa minimum working pressure and minimum continuous water temperature of 225 deg F(107 deg C).

A. Construction: Radially split, all-bronze casing.

B. Impeller: ASTM B 36/B 36M, rolled brass; or ASTM B 584, cast bronze; overhung, single suction, and keyed to shaft.
C. Seal: Mechanical.
D. Shaft and Sleeve: Steel shaft, with oil-lubricated copper sleeve.
E. Pump Bearings: Oil-lubricated, bronze-journal or thrust type.
F. Shaft Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment.
G. Motor: Single speed, with oil-lubricated bearings, unless otherwise indicated; and resiliently mounted to pump casing.
H. Motor Size: For motors larger than ½ hp, select motor size that will not overload through full range of pump performance curve.

## PART 3 EXECUTION

**EXAMINATION:**

Examine roughing-in of water distribution piping to verify actual locations of connections before pump installation.

**INSTALLATION:**

Install pumps according to manufacturer's written instructions and with access for periodic maintenance, including removing motors, impellers, couplings, and accessories.

Support pumps and piping so weight of piping is not supported by pumps.

Suspend horizontal in-line pumps independent of piping. Use continuous-thread hanger rods and vibration isolation hangers of sufficient size to support pump weight. Fabricate brackets or supports as required. Refer to Division 22 Section "Hangers and Supports" for materials.

Suspend vertical in-line pumps independent of piping. Use continuous-thread hanger rods and vibration isolation hangers of sufficient size to support pump weight. Refer to Division 22 Section "Hangers and Supports" for materials.

**CONNECTIONS:**

Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties. The following are specific connection requirements:

A. Connect water distribution piping to pumps. Install suction and discharge pipe equal to or greater than size of pump nozzles. Refer to Division 22 Section "Water Distribution Piping."
B. Install shutoff valve and strainer on suction side of pumps, and check valve and throttling valve on discharge side of pumps. Install valves same size as connected piping. Refer to Division 22 Section "Valves" for general-duty valves and Division 22 Section "Plumbing Specialties" for strainers.
C. Install pressure gages at suction and discharge of pumps. Install at integral pressure-gage tappings where provided or install pressure-gage connectors in suction and discharge piping around pumps. Refer to Division 22 Section "Meters and Gages" for pressure gages and gage connectors.

Electrical wiring and connections are specified in Division 26 Sections.

Ground equipment.

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.

**COMMISSIONING:**

Check suction piping connections for tightness.

Clean strainers on suction piping.

Controls: Set for automatic starting and stopping operation.

Final Checks before Starting: Perform the following preventive maintenance operations:

A. Lubricate oil-lubricated-type bearings.
B. Verify that pump is free to rotate by hand and that pump for handling hot liquids is free to rotate with pump hot and cold. Do not operate pump if it is bound or drags, until cause of trouble is determined and corrected.
C. Verify that pump controls are correct for required application.

Starting procedure for pumps is as follows:

A. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
B. Open circulating line valve if pump should not be operated against dead shutoff.
C. Start motor.
D. Open discharge valve slowly.
E. Check general mechanical operation of pump and motor.
F. Close circulating line valve once there is sufficient flow through pump to prevent overheating.

**DEMONSTRATION:**

Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain pumps as specified below:

A. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining pumps.
B. Review data in maintenance manuals. Refer to Division 1 Section "Contract Closeout."
C. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
D. Schedule training with Owner with at least seven days' advance notice.

**END OF SECTION**

## 22 34 00 FUEL-FIRED DOMESTIC WATER HEATERS

# PART 1 GENERAL

### RELATED DOCUMENTS

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

### SUMMARY

This Section includes the following for domestic water systems:

A. Commercial, gas water heaters.
B. Compression tanks.
C. Accessories.

### SUBMITTALS

Product Data: For each type and size of water heater. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

Shop Drawings: Detail water heater assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

A. Wiring Diagrams: Power, signal, and control systems. Differentiate between manufacturer-installed and field-installed wiring.

Product Certificates: Signed by manufacturers of water heaters certifying that products furnished comply with requirements.

Maintenance Data: For water heaters to include in maintenance manuals specified in Division 1.

Warranties: Special warranties specified in this Section.

### QUALITY ASSURANCE

Source Limitations: Obtain same type of water heaters through one source from a single manufacturer.

Product Options: Drawings indicate size, profiles, and dimensional requirements of water heaters and are based on specific units indicated. Other manufacturers' products complying with requirements may be considered. Refer to Division 1 Section "Substitutions."
Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.
ANSI Compliance: Provide gas water heaters that comply with ANSI standards for gas water heaters and related products and that bear AGA certification label.
ASME Compliance: Fabricate and label water heater, hot-water storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.

ASHRAE Standards: Comply with performance efficiencies prescribed for the following:

ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings," for commercial water heaters.
ASHRAE 90.2, "Energy Efficient Design of New Low-Rise Residential Buildings," for household water heaters.

**WARRANTY**
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.

Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of water heaters that fail in materials or workmanship within specified warranty period.

A. Failures include storage tanks, circulators, and burner assemblies.
B. Warranty Period: From date of Substantial Completion:
   1. Storage Tanks: 5 years.
   2. Circulators: 1 year.
   3. Burner Assemblies: 5 years.

## PART 2 PRODUCTS

**MANUFACTURERS**

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

A. Commercial, Horizontal-Grid, Tube-Type, Gas Water Heaters:
   2. Lochinvar Corp.
   3. Raypak, Inc.
   4. Smith: A. O. Smith Water Products Co.
   5. Teledyne Laars.

C. Compression Tanks:
   1. Amtrol, Inc.
   2. Armstrong Pumps, Inc.
   3. Smith: A. O. Smith; Aqua-Air Div.
   4. State Industries.
   5. Taco, Inc.

**COMMERCIAL, GAS WATER HEATERS**

The water containing section shall consist of a heat exchanger constructed of a "Fin Tube" design, with straight copper tubes having extruded integral fins spaced seven (7) fins per inch. These tubes shall be "rolled" securely into glass-lined, cast iron headers. There shall be no bolts, gaskets or "O" rings in the head configuration. Removable access plugs shall be provided on the heat exchanger headers for the purposes of inspection, cleaning or repair. Water Heater drains shall be provided, having external access. The heat exchanger shall be mounted in a stress free jacket assembly in order to provide a "free floating design" able to withstand the effects of thermal shock. The water

heater shall bear the ASME "HLW" stamp for 160 psi working pressure and shall be National Board listed.

The combustion chamber shall be constructed of stainless steel and sealed for combustion. The burner surface shall be constructed of heavy-duty ceramic material and fire in a vertical plane within the combustion chamber. The burner shall employ a special perforated flame injection tube extending the entire length of the heat exchanger. The burner shall fire in a full 360-degree pattern resulting in uniform heat transfer upon every inch of heating surface. A viewing port shall be provided, permitting visual observation of burner operation.

Firing Controls must be capable of firing at a complete blue flame with maximum gas and air input, as well as firing infrared when gas and air are reduced. Water heater must be capable of firing from 20 percent up to 100 percent of rated input when supplied with 4 inches water column of inlet gas pressure for a turndown ratio of 5:1.

The water heater shall use a combustion air blower, utilizing pulse width modulation, to draw a precise mixture of fuel and air into the combustion chamber for maximum efficiency. The combustion air blower shall operate for a pre-purge period before burner ignition and a post-purge period after burner operation to clear the combustion chamber. The water heater shall be equipped with a replaceable combustion air filter to protect the blower and burner from contaminants and debris.

The water heater shall incorporate a gas train consisting of a pre-mix gas valve to supply gas and combustion air in exact proportions to allow burner input to vary based on load. The pre-mix gas valve shall perform the functions of safety shutoff, constant pressure regulation and air/gas ratio control. Full closing of the valve seat shall occur in less than 0.8 seconds when the valve is de-energized.

The water heater shall be constructed with an 18 gauge pre-painted steel jacket assembly. The interior of the combustion chamber and flue collector shall be stainless steel. All inner jacket panels shall be fully gasketed and sealed. The jacket assembly shall be primed and pre-painted on both sides. All models shall be certified for installation on combustible floors without additional safety provisions. The water heater shall be suitable for installation with zero clearance from combustible material on the left and right side.

The water heater’s standard construction shall include an air pressure switch to prove combustion air flow, a flow switch to prove water flow, downstream test valve and a factory installed ASME temperature and pressure relief valve. Standard controls shall include manual reset high limit, pump control for dedicated water heater pump. Standard construction shall include terminal strips for supply voltage connection, pump control connections, contacts for any failure, contacts for air louvers and run time contacts. The manufacturer shall verify proper operation of the burners, all controls and the heat exchanger by connection to gas, water and venting for a full factory fire test.

The water heater shall be equipped with an Electronic Integrated Control Module with a microprocessor-based platform incorporating software customized for operation. All internal safety, operating and ignition controls shall be included in the electronic integrated control module. The electronic integrated control module shall provide on/off control of the gas supply to the burner, operation of the combustion air blower, ignition of the gas-air mixture, flame proving, control of water temperature set points, and monitoring of all safety functions.

The water heater shall have a 2-line, 16 character LCD display, password security, pump delay with freeze protection, pump exercise and PC port connection. The water heater shall allow 0-10 VDC input connection for BMS control and have built-in “Cascade” to sequence and rotate while maintaining modulation of up to eight water heaters without utilization of an external controller. Supply voltage shall be 120 volt, 60 hertz, single phase.

Local communication, programming and a display of operating and alarm status conditions shall be accessible through the control panel. The control panel shall contain an on/off main power switch, a digital display of a temperature functions, the operational status of the water heater, or an active alarm fault. Data points visible in the digital display include inlet water temperature, outlet water temperature, water temperature differential, percent firing rate, setpoint temperatures and setpoint differential. Operational status shall be displayed for Off, Standby, Pre-purge, Ignition, and Post-purge. Fault status shall be provided for high limit, gas pressure, low water, blocked drain, louver proving, and air pressure switch status.

The water heater standard control system shall include an electronically proven hot surface ignition system with full flame monitoring capability and a built-in low gas pressure regulator. A 24 VAC control circuit and components shall be used. All components shall be easily accessed and serviceable from the front and top of the unit. Standard operating controls shall utilize a return water temperature sensor, an outlet water temperature sensor and a flue temperature sensor for the Smart System control module. An adjustable immersion type, manual reset safety high limit shall be provided to limit water temperature.

The Firing Control System shall be 5:1 Modulating Firing with Hot Surface Ignition and Electronic Supervision.

All flue and air inlet pipe shall be provided by the installing contractor. The water heater shall be equipped with Category II Negative Draft Flue with combustion air from the equipment room.

The water heater shall be supplied with a circulating pump of sufficient capacity to ensure scale-free heater performance. The pump shall be all bronze and provided for operation on 120 volt. 60 hertz, 1 phase power supply (unless otherwise specified).

The circulating pump shall be all bronze and operate on a 120 volt, 60 cycle, 1 phase power supply (unless otherwise specified). The pump shall be wired to run with intermittent pump operation.

The storage tank shall be a vertical tank having a storage capacity as scheduled on the plans. The tank shall be constructed with an inner chamber designed to receive all circulation to and from the water heater to eliminate turbulence in the tank. The baffled tank shall supply 80% of tank capacity without a drop in outlet temperature.

The storage tank shall be constructed in accordance with ASME requirements. The storage tank shall have a working pressure of 125 psi. The storage tank shall be glass lined and fired to 1600°F to ensure a molecular fusing of glass and steel, and carry a five (5) year limited warranty. The tank shall be constructed with a heavy gauge galvanized steel jacket assembly, primed and pre-painted on both sides with a minimum dry film thickness of 0.70 mils. The jacket and tank base shall be a water tight construction with a built-in drain pan, complete with a ¾" drain connection to assist in protecting against damage in the event of a tank or component leakage. The Storage Tank shall be completely encased in high density insulation of sufficient thickness to meet the energy efficiency requirements of the latest edition of the ASHRAE 90.1 Standard. The entire assembly shall be mounted on "I" beam skids to facilitate handling and installation.

**COMPRESSION TANKS**

Description: Steel, pressure-rated tank constructed with welded joints and factory installed, butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.

Construction: 125 psig working pressure rating.

Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1, pipe thread.

Tank Interior Finish: Materials and thicknesses complying with NSF 61, barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.

Tank Exterior Finish: Manufacturer's standard, unless finish is indicated.

Air-Charging Valve: Factory installed.

**WATER HEATER ACCESSORIES**

Combination Temperature and Pressure Relief Valves: According to the following:

A. Gas Water Heaters: ANSI Z21.22, combination temperature and pressure relief valve.

## PART 3 EXECUTION

**CONCRETE BASES**

Install concrete bases of dimensions indicated. Refer to Division 3 Section "Cast-in-Place Concrete" and Division 22 Section "Basic Mechanical Materials and Methods."

**WATER HEATER INSTALLATION**

Install commercial water heaters on concrete bases.

A. Exception: Omit concrete bases for commercial water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.

Install water heaters, level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

Anchor water heaters to substrate.

Install and connect gas water heaters according to NFPA 54.

Install appliance, gas pressure regulators on gas-burner inlets of water heaters without pressure regulators.

Install vent piping from gas-train pressure regulators and valves to outside of building where required. Terminate vent piping with brass-screened vent cap fitting. Do not combine vents except with approval of authorities having jurisdiction.

Install temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend relief valve outlet with water piping in continuous downward pitch and discharge onto closest floor drain.

Install water heater drain piping as indirect waste to spill into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 22 Section "Plumbing Specialties" for drain valves.

Install thermometers on water heater inlet and outlet piping. Refer to Division 22 Section "Meters and Gages" for thermometers.

Install pressure gages on water heater piping. Refer to Division 22 Section "Meters and Gages" for pressure gages.

Assemble and install inlet and outlet piping manifold kits for multiple water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each water heater. Include shutoff valve, and thermometer in each water heater inlet and outlet, and throttling valve in each water heater outlet. Refer to Division 22 Section "Valves" for general-duty valves and Division 22 Section "Meters and Gages" for thermometers.

Arrange for insulation on equipment and piping not furnished with factory-applied insulation.

Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.

Fill water heaters with water.

Charge compression tanks with air.

**CONNECTIONS**

Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

Install piping adjacent to machine to allow service and maintenance.

Connect hot- and cold-water piping with shutoff valves and unions. Connect hot-water-circulating piping with shutoff valve, check valve, and union.

Connect gas piping to gas burner with drip leg, tee, shutoff valve, and union; minimum size same as inlet connection.

Make connections with dielectric fittings where piping is made of dissimilar metal.

Gas, Water Heater Vent Connections: Connect to vent system. Include draft hoods and diverters where required. Use vents same size as or larger than water heater outlets, but not smaller than indicated unless smaller vent size has been calculated according to NFPA 54. Comply with gas utility requirements for sizing. Gas vents are specified in Division 22 Section "Breechings, Chimneys, and Stacks."

Electrical Connections: Power wiring and disconnect switches are specified in Division 26 Sections. Arrange wiring to allow unit service.

Ground equipment.

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

**FIELD QUALITY CONTROL**

Engage a factory-authorized service representative to perform startup service.

In addition to manufacturer's written installation and startup checks, perform the following:

A. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment and retest until satisfactory results are achieved.
B. Verify that piping system tests are complete.
C. Check for piping connection leaks.
D. Check for clear relief valve inlets, outlets, and drain piping.
E. Check operation of circulators.
F. Test operation of safety controls, relief valves, and devices.
G. Energize electric circuits.
H. Adjust operating controls.
I. Adjust hot-water-outlet temperature settings. Do not set above 140 deg F (60 deg C) unless piping system application requires higher temperature.
J. Balance water flow through manifolds of multiple-unit installations.

**DEMONSTRATION**

Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain water heaters.

Train Owner's maintenance personnel on procedures for starting and stopping troubleshooting, servicing, and maintaining equipment.

Review data in maintenance manuals. Refer to Division 1 Section "Contract Closeout."
Review date in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."

Schedule training with Owner, through Architect, with at least seven days' advance notice.

**END OF SECTION**

## 23 05 05 MECHANICAL GENERAL PROVISIONS

### PART 1 GENERAL

**GENERAL INFORMATION:**

The General Requirements and Supplementary Conditions are part of this contract and govern work under this division.

Temporary heating and air conditioning shall be the responsibility of the General Contractor. If the Contractor uses the permanent heating or air conditioning systems for temporary heating or air conditioning, extended warranties will be required on all equipment in use and replace filters in all units once a week. The extended warranties and filter replacement will need to cover the period between when the systems are turned on through Final Acceptance of the building. This shall include boilers, pumps, FPVAV's and AHU's, Etc. At the time of final inspection, if it is found that the interior of ductwork is dirty beyond normal standards, the ductwork systems shall be cleaned at the Contractor's expense.

**SCOPE OF WORK:**

Work by Mechanical Contractor: Provide all mechanical systems indicated by the drawings, specified or as instructed otherwise. Unless specified otherwise, provide all labor, materials and equipment necessary to provide a complete and operational system.

Work by Electrical Contractor: Provide all line voltage wiring and install items of equipment furnished by the Mechanical, such as thermostats, remote control panels, etc.

Mechanical and Electrical Coordination: The Mechanical will provide to the Electrical all manufacturer's wiring diagrams and installation data and locate all equipment furnished to the Electrical.

Where work or materials are specified or shown on drawings to be performed by more than one Contractor, each such Contractor will be deemed to have figured the item and the Architect will determine who shall furnish the work and who shall submit the credit to the Owner.

Work by General Contractor: Provide all openings and chases with proper framing and reinforcing as required for Mechanical equipment.

Provide access panels or doors where required for mechanical systems.

**DEFINITIONS:**

Contractor: The contractor performing work under this Division of the Specifications.

Provide: Contractor is responsible to furnish and install component completely.

**QUALITY ASSURANCE:**

Manufacturers: Acceptable manufacturers are listed in applicable sections of the Specifications and on the drawings.

Drawings and Specifications are complimentary. Requirements indicated in either are binding and the most stringent is to be used.

The Contractor is to review documents for the work, and if any discrepancies occur between the work of this Division and the work of another Division, is to notify the Architect and obtain written instructions for any changes necessary. Any changes in the work by this Division made necessary by the failure or neglect of the Contractor to report such discrepancies will be made by, and at the expense of the Contractor.

Changes in Design or Installation: Refer to the General and Supplementary Conditions for requirements pertaining to changes in design and installation. Mechanical installation will otherwise be in accordance with the Contract Drawings and Specifications.

**REGULATORY AGENCIES:**

Permits and Fees: The Contractor is to pay for all permits and fees as required by Local or State regulatory agencies.

Codes: Work for this project is to comply with Federal, State and Local codes, ordinances and regulations. All work shall comply the latest adopted edition of the Building Code and associated sections of the National Fire Protection Association.

Work shall be done according to applicable codes in cases of conflict between specifications, plans and codes, except where plans and specifications call for higher standards than the codes.

**SUBMITTALS AND SHOP DRAWINGS:**

Submit product data and copies of shop drawings for all major pieces of equipment as indicated in the respective sections of this Division.

The intent of shop drawing submittals by the Contractor is to demonstrate to the Architect / Engineer that the Contractor understands the design concept and demonstrates his understanding by indicating and detailing the fabrication and installation methods to be used.

If deviations, discrepancies or conflicts between shop drawing submittals and Contract Documents are discovered either prior to or after shop drawing submittals are processed, the design drawings and specifications shall take precedence.

The Architect / Engineer shall review shop drawings for general conformance with the design concept of the project. The review shall not relieve the Contractor of the responsibility of compliance with the contract documents, installation of equipment per manufacturer's requirements, or errors in the shop drawings.

**PRODUCT DELIVERY, STORAGE AND HANDLING:**

Make provisions for the delivery and safe storage of all material and make the required arrangements with other trades to coordinate moving large pieces of equipment into the building.

Where materials are indicated to be "Furnished by Others" to the Contractor for installation, these materials shall be checked and their delivery properly receipted. After delivery the Contractor assumes all responsibility for the safekeeping of such equipment.

All materials stored outside are to be covered and protected with weatherproof material.

**JOB CONDITIONS:**

Verify existing site conditions and location prior to bidding.

Verify existing utilities and the actual location of in reference to location of such as shown on drawings. Any deviations between actual conditions and plan locations will be reviewed with the Architect. Repair, patch or terminate utilities encountered in an acceptable manner regardless of whether shown or not.

**GUARANTEE:**

The Contractor is to guarantee all materials, equipment, workmanship and operation of all systems for a period of one (1) year from the date of final acceptance of the entire project. Guarantee to repair or replace at Contractor's expense any art of the work which may be defective during that time provided that such defect is, in the opinion of the Architect / Engineer, due to imperfect material or workmanship and not to carelessness or improper use.

## PART 2 PRODUCTS

**STANDARDS FOR EQUIPMENT AND MATERIALS:**

All material shall be labeled UL, ETL, AGA or other approved independent testing authority. Air conditioning equipment shall be ARI certified.

All pressure rated vessels shall be provided with an ASME stamp, meeting the ASME Code or the Local Authority, whichever is most stringent.

All materials and equipment shall be of the best quality and be new, unused and without damage.

System design is based upon the first manufacturer listed in the Specifications and the other named manufacturers are considered equivalent. Any costs attributed in changes in ductwork, piping, plumbing, space clearances or other trades is to be borne by the Contractor when another manufacturer is used in lieu of the first listed.

**MATERIALS OF APPROVED EQUAL:**

Unless request for changes in base bid specifications are received and approved ten (10) days prior to the opening of bids, the successful Contractor will be held to furnish specified items under base bid.

## PART 3 EXECUTION

**PREPARATION:**

Base final installation of all materials and equipment on field dimensions and conditions at the building. The Mechanical Contractor is to inspect all work that affects the work of this Division and report any deficiencies to the General Contractor and Architect. No extra compensation will be allowed on account of minor differences in actual dimensions and those indicated on the plans.

**INSTALLATION:**

Workmanship: Perform all work in accordance with good commercial practice.

Supervision: The superintendent shall be responsible for the work of this Division and of all subcontractors under this Division. All questions or directions will be directed through the superintendent.

Installation Procedures:

A. Field verify exact location, size, routing, elevation and accessibility of existing and new HVAC and plumbing systems.
B. Properly size and locate all anchors, chases, recesses and openings required for the proper installation of the work.
C. Piping and equipment located in areas subject to low temperatures shall be installed in a manner to prevent freezing.
D. All equipment and materials are to be installed as high as possible.
E. Install equipment and systems in accordance with manufacturer's recommends, accepted industry standards and all applicable Codes.
F. Provide temporary filters in all air systems during construction. Install new clean filters prior to testing and balancing systems. Provide an extra set of filters to Owner at completion of project.

**END OF SECTION**

# 23 05 06 BASIC HVAC MATERIALS AND METHODS

## PART 1 GENERAL

### RELATED DOCUMENTS:

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

### SUMMARY:

This Section includes the following basic mechanical materials and methods to complement other Division 23 Sections.

A. Piping materials and installation instructions common to most piping systems.
B. Dielectric fittings.
C. Flexible connectors.
D. Field-fabricated metal and wood equipment supports.
E. Installation requirements common to equipment specification sections.
F. Mechanical demolition.
G. Cutting and patching.

Pipe and pipe fitting materials are specified in Division 23 piping system Sections.

### DEFINITIONS:

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.

Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

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.

The following are industry abbreviations for rubber materials:

A. CR: Chlorosulfonated polyethylene synthetic rubber.
B. EPDM: Ethylene propylene diene terpolymer rubber.

### SUBMITTALS:

Product Data: For dielectric fittings, flexible connectors, mechanical sleeve seals, and identification

materials and devices.

Shop Drawings: Detail fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.

**QUALITY ASSURANCE:**

Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

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.

**DELIVERY, STORAGE, AND HANDLING:**

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.

Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.

Protect flanges, fittings, and piping specialties from moisture and dirt.

**SEQUENCING AND SCHEDULING:**

Coordinate mechanical equipment installation with other building components.

Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.

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.

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.

Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces.

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.

## PART 2 PRODUCTS

**MANUFACTURERS:**

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

A. Dielectric Unions:
   1. Capitol Manufacturing Co.
   2. Central Plastics Co.
   3. Eclipse, Inc.; Rockford-Eclipse Div.
   4. Epco Sales Inc.
   5. Hart Industries International, Inc.
   6. Watts Industries, Inc.; Water Products Div.
   7. Zurn Industries, Inc.; Wilkins Div.

B. Dielectric Flanges:
   1. Capitol Manufacturing Co.
   2. Central Plastics Co.
   3. Epco Sales Inc.
   4. Watts Industries, Inc.; Water Products Div.

C. Dielectric-Flange Insulating Kits:
   1. Calpico, Inc.
   2. Central Plastics Co.

D. Dielectric Couplings:
   1. Calpico, Inc.
   2. Lochinvar Corp.

E. Dielectric Nipples:
   1. Grinnell Corp.; Grinnell Supply Sales Co.
   2. Perfection Corp.
   3. Victaulic Co. of America.

F. Metal, Flexible Connectors:
   1. ANAMET Industrial, Inc.
   2. Central Sprink, Inc.
   3. Flexicraft Industries.
   4. Flex-Weld, Inc.
   5. Grinnell Corp.; Grinnell Supply Sales Co.
   6. Hyspan Precision Products, Inc.
   7. McWane, Inc.; Tyler Pipe; Gustin-Bacon Div.
   8. Mercer Rubber Co.
   9. Metraflex Co.
   10. Proco Products, Inc.
   11. Uniflex, Inc.
   12. Flexonics.

**PIPE AND PIPE FITTINGS:**

Refer to individual Division 23 piping Sections for pipe and fitting materials and joining methods.

Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

**JOINING MATERIALS:**

Refer to individual Division 23 piping Sections for special joining materials not listed below.

Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

A. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness, unless thickness or specific material is indicated.
   1. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   2. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.

Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.

A. Sleeve: ASTM A 126, Class B, gray iron.
B. Followers: ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 536 ductile iron.
C. Gaskets: Rubber.
D. Bolts and Nuts: AWWA C111.
E. Finish: Enamel paint.

**DIELECTRIC FITTINGS:**

General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.

Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.

Insulating Material: Suitable for system fluid, pressure, and temperature.

Dielectric Unions: Factory-fabricated, union assembly, for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C).

Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig (1035- or 2070-kPa) minimum working pressure as required to suit system pressures.

Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic

washers, and steel backing washers.

A. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig (1035- or 2070-kPa) minimum working pressure as required to suit system pressures.

Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

**FLEXIBLE CONNECTORS:**

General: Fabricated from materials suitable for system fluid and that will provide flexible pipe connections. Include 125-psig (860-kPa) minimum working-pressure rating, unless higher working pressure is indicated, and ends according to the following:

A. 2-Inch NPS (DN50) and Smaller: Threaded.
B. 2-1/2-Inch NPS (DN65) and Larger: Flanged.
C. Option for 2-1/2-Inch NPS (DN65) and Larger: Grooved for use with keyed couplings.

Stainless-Steel-Hose/Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include steel nipples or flanges, welded to hose.

Stainless-Steel-Hose/Stainless-Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include stainless-steel nipples or flanges, welded to hose.

## PART 3 EXECUTION

**PIPING SYSTEMS - COMMON REQUIREMENTS:**

General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 23 piping Sections specify unique piping installation requirements.

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.

Install piping at indicated slope.

Install components with pressure rating equal to or greater than system operating pressure.

Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

Install piping free of sags and bends.

Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs

are prohibited, unless otherwise indicated.

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.

Install piping to allow application of insulation plus 1-inch (25-mm) clearance around insulation.

Locate groups of pipes parallel to each other, spaced to permit valve servicing.

Install fittings for changes in direction and branch connections.

Install couplings according to manufacturer's written instructions.

Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:

A. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish. Use split-casting escutcheons if required, for existing piping.
B. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
C. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
D. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
E. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.

Sleeves are not required for core drilled holes.

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 Section "Firestopping" for materials.

Verify final equipment locations for roughing-in.

Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
    1. 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.
    2. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
    3. Align threads at point of assembly.
    4. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
    5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. 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.
E. 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.

Piping Connections: Make connections according to the following, unless otherwise indicated:

A. Install unions, in piping 2-inch NPS (DN50) and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS (DN50) or smaller threaded pipe connection.
B. Install flanges, in piping 2-1/2-inch NPS (DN65) and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
C. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
D. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

**EQUIPMENT INSTALLATION - COMMON REQUIREMENTS:**

Install equipment to provide maximum possible headroom, if mounting heights are not indicated.

Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.

Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

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.

Install equipment giving right of way to piping installed at required slope.

Install flexible connectors on equipment side of shutoff valves, horizontally and parallel to equipment shafts if possible.

**ERECTION OF METAL SUPPORTS AND ANCHORAGE:**

Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

**DEMOLITION:**

Disconnect, demolish, and remove Work specified in Division 23 Sections.

If pipe, ductwork, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.

Accessible Work: Remove indicated exposed pipe and ductwork in its entirety.

Work Abandoned in Place: Cut and remove underground pipe a minimum of 2 inches (50 mm) beyond face of adjacent construction. Cap and patch surface to match existing finish.

Removal: Remove indicated equipment from Project site.

Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

**CUTTING AND PATCHING:**

Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.

Repair cut surfaces to match adjacent surfaces.

**END OF SECTION**

## 23 11 23 NATURAL-GAS PIPING

### PART 1 GENERAL

**RELATED DOCUMENTS:**

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

**SUMMARY:**

This Section includes fuel gas piping, specialties, and accessories within the building.

Related Sections include the following:

A. Division 23 Section "Meters and Gages" for pressure gages.

**PROJECT CONDITIONS:**

Gas System Pressures: Two pressure ranges. Primary pressure is more than 0.5 psig (3.45 kPa) but not more than 5.0 psig, and is reduced to secondary pressure of 0.5 psig or less.

**SUBMITTALS:**

Product Data: For the Following:

A. Specialty valves: Include pressure rating, capacity, settings, and electrical connection data of selected models.
B. Pressure regulators: Include pressure rating, capacity, and settings of selected models.

Field Test Reports: Indicate and interpret test result for compliance with performance requirements.

Maintenance Data: For natural gas specialties and accessories to include in maintenance manuals specified in Division 1.

**QUALITY ASSURANCE:**

Electrical Components and Devices: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.

ANSI Standard: Comply with ANSI Z223.1, "National Fuel Gas Code."

UL Standard: Provide components listed in UL's "Gas and Oil Equipment Directory" if specified to be UL listed.

**COORDINATION:**

Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

A. Notify Owner/Architect not less than two days in advance of proposed utility interruptions.
B. Do not proceed with utility interruptions without Architect's written permission.

## PART 2 PRODUCTS

**MANUFACTURERS:**

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

A. Appliance Connector Valves
   1. Conbraco Industries, Inc.; Apollo Division
   2. Jomar International, Ltd.
   3. McDonald: A.Y. McDonald Mfg. Co.
   4. Mueller Co.; Mueller Gas Products Division
   5. Watts Industries, Inc.; Water Products Division

B. Gas Valves, NPS 2 (DN 50) and Smaller
   1. Crane Valves
   2. Flow Control Equipment, Inc.
   3. Honeywell, Inc.
   4. Jomar International, Ltd.
   5. McDonald: A.Y. McDonald Mfg. Co.
   6. Milwaukee Valve Co., Inc.
   7. Mueller Co.; Mueller Gas Products Division
   8. Nibco, Inc.
   9. Watts Industries, Inc.; Water Products Division

C. Plug Valves, NPS 2-1/2 (DN 65) and Larger
   1. Flow Control Equipment, Inc.
   2. Milliken Valve Co., Inc.
   3. Nordstrom Valves, Inc.

D. Automatic Gas Valves
   1. ASCO General Controls
   2. Eaton Corporation; Controls Division
   3. GPS Gas Protection Systems, Inc.
   4. Honeywell, Inc.
   5. Johnson Controls, Inc.

E. Electrically Operated Gas Valves
   1. ASCO General Controls
   2. Magnatrol Valve Corporation

L. Service-Pressure Regulators
   1. American Meter Co.
   2. Fisher Controls International, Inc.
   3. National Meter

M. Line Pressure Regulators
   1. American Meter Co.
   2. Fisher Controls International, Inc.
   3. Maxitrol Co.
   4. National Meter

N. Appliance Pressure Regulators

A. Eaton Corporation; Controls Division
B. Maxitrol Co.

**PIPING MATERIALS:**

Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

**PIPES, TUBES, FITTINGS, AND JOINING MATERIALS:**

Steel Pipe: ASTM A 53; Type E or S; Grade B; Schedule 40; black.

A. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern, with threaded ends according to ASME B1.20.1.
B. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends according to ASME B1.20.1.
C. Cast-Iron Flanges and Flanged Fittings: ASME B16.1, Class 125.
D. Steel Welding Fittings: ASME B16.9, wrought steel or ASME B16.11, forged steel.
E. Steel Threaded Fittings: ASME B16.11, forged steel with threaded ends according to ASME B1.20.1.
F. Joint Compound and Tape: Suitable for natural gas.
G. Steel Flanges and Flanged Fittings: ASME B16.5.
H. Gasket Material: Thickness, material, and type suitable for natural gas.

Transition Fittings: Type, material, and end connections to match piping being joined.

Common Joining Materials: Refer to Division 23 Section "Basic Mechanical Materials and Methods" for joining materials not in this Section.

**PROTECTIVE COATING:**

Furnish pipe and fittings with factory-applied, corrosion-resistant polyethylene coating for use in corrosive atmosphere.

**PIPING SPECIALTIES:**

Flexible Connectors: ANSI Z21.24, copper alloy.

Quick-Disconnect Devices: ANSI Z21.41, convenience outlets and matching plug connector.

**SPECIALTY VALVES:**

Valves, NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.

Valves, NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.

Appliance Connector Valves: ANSI Z21.15 and IAS listed.

Gas Stops: Bronze body with AGA stamp, plug type with bronze plug and flat or square head, ball type with chrome-plated brass ball and lever handle, or butterfly valve with stainless-steel disc and fluorocarbon elastomer seal and lever handle; 2 psig (13.8 kPa) minimum pressure rating.

Gas Valves, NPS 2 (DN 50) and Smaller: ASME B16.33 and IAS-listed bronze body and 125 psig (860 kPa) pressure rating.

A. Tamperproof Feature: Include design for locking.

Plug Valves, NPS 2-1/2 (DN 65) and Larger: ASME B16.38 and MSS SP-78 cast-iron, lubricated plug valves, with 125 psig (860 kPa) pressure rating.

A. Tamperproof Feature: Include design for locking.

General-Duty Valves, NPS 2-1/2 (DN 65) and Larger: ASME B16.38, cast-iron body, suitable for fuel gas service, with "WOG" indicated on valve body, and 125 psig (860 kPa) pressure rating.

A. Butterfly Valves: MSS SP-67, lug type with lever handle.

Automatic Gas Valves: ANSI Z21.21, with mechanical operator for actuation by appliance automatic shutoff device.

Electrically Operated Gas Valves: UL 429, bronze, aluminum, or cast-iron body solenoid valve; 120-V ac, 60 Hz, Class B, continuous-duty molded coil. Include NEMA ISC 6, Type 4, coil enclosure and electrically opened and closed dual coils. Valve position shall normally be closed.

**PRESSURE REGULATORS:**

Description: Single stage and suitable for fuel gas service. Include steel jacket and corrosion-resistant components, elevation compensator, and atmospheric vent.

A. NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.
B. NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.
C. Service Pressure Regulators: ANSI Z21.80. Include 100 psig (690 kPa) minimum inlet pressure rating.
D. Line Pressure Regulators: ANSI Z21.80 with 2 psig (13.8 kPa) minimum inlet pressure rating.
E. Appliance Pressure Regulators: ANSI Z21.18. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.

Pressure Regulator Vents: Factory- or field -installed, corrosion-resistant screen in opening if not connected to vent piping.

## PART 3 EXECUTION

**PREPARATION:**

Close equipment shutoff valves before turning off fuel gas to premises or section of piping. Perform leakage test as specified in "Field Quality Control" Article to determine that all equipment is turned off in affected piping section.

Comply with ANSI Z223.1, "Prevention of Accidental Ignition" Paragraph.

**SERVICE-METER ASSEMBLY INSTALLATION:**

Install service-meter assemblies above ground. Include gas valve or plug valve, strainer, service pressure regulator, and service meter for each assembly.

Install gas valve or plug valve and strainer upstream from each service pressure regulator.

Install service pressure regulators with vent outlet turned down and with corrosion-resistant-metal insect screen.

Install pressure gage upstream and downstream from each service pressure regulator.

Install service meters downstream from service pressure regulators.

A. Service meters with connections NPS 1(DN 25) and smaller on meter bars.
B. Service meters with connections larger than NPS 1 (DN 25) supported from piping or set on concrete bases.

**PIPING APPLICATIONS:**

Flanges, unions, transition, and special fittings with pressure ratings same as or higher than system pressure rating may be used in applications below, unless otherwise indicated.

Fuel Gas Piping 5 psig (3.45 kPa) or Less: Use the following:

A. NPS ½ (DN 15) and Smaller: NPS 3/4 (DN 20) steel pipe, malleable-iron threaded fittings, and threaded joints.
B. NPS 3/4 and NPS 1 (DN 20 and DN 25): Steel pipe, malleable-iron threaded fittings, and threaded joints.
C. NPS 1-1/4 to NPS 2 (DN 32 to DN 50): Steel pipe, malleable-iron threaded fittings, and threaded joints.
D. NPS 1-1/4 to NPS 2 (DN 32 to DN 50): Steel pipe, steel welding fittings, and welded joints.
E. NPS 2-1/2 (DN 65) and Larger: Steel pipe, steel welding fittings, and welded joints.

Gas Service Piping at Meters and Regulators, Above 5 psig (34.5 kPa): Steel pipe, steel welding fittings, and welded joints.

**VALVE APPLICATIONS:**

Appliance Shutoff Valves for Pressure 0.5 psig (3.45 kPa) or Less: Appliance connector valve or gas stop.

Appliance Shutoff Valves for Pressure 0.5 to 2 psig (3.45 to 13.8 kPa): Gas stop or gas valve.

Appliance Shutoff Valves for Pressure 2 to 5 psig (13.8 to 34.5 kPa): Gas valve.

Piping Line Valves, NPS 2 (DN 50) and Smaller: Gas valve.

Piping Line Valves, NPS 2-1/2 (DN 65) and Larger: Plug valve or general-duty valve.

Valves at Service Meter, NPS 2(DN 50) and Smaller: Gas valve.

Valves at Service Meter, NPS 2-1/2 (DN 65) and Larger: Plug valve.

**PIPING INSTALLATION:**

Refer to Division 23 Section "Basic Mechanical Materials and Methods" for basic piping installation requirements.

Drips and Sediment Traps: Install drips at points where condensate may collect. Include outlets of service meters. Locate where readily accessible for cleaning and emptying. Do not install where condensate would be subject to freezing.

Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

Connect branch piping from top or side of horizontal piping.

Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.

Install strainer on inlet of each line pressure regulator and automatic and electrically operated valve.

Install pressure gage upstream and downstream from each line pressure regulator.

Install flanges on valves, specialties, and equipment having NPS 2-1/2 (DN 65) and larger connections.

Install vent piping for gas pressure regulators and gas trains, extend outside building, and vent to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end.

**JOINT CONSTRUCTION:**

Refer to Division 23 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

Use materials suitable for fuel gas.

**HANGER AND SUPPORT INSTALLATION:**

Refer to Division 23 Section "Hangers and Supports" for pipe hanger and support devices.

Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

A. NPS 1-1/2 (DN 25) and Smaller: Maximum span, 5'0" (2438 mm).
B. NPS 2 (DN 100) and Larger: Maximum span, 10' (3 m). Minimum rod size to be per manufacturer's written instructions for service conditions based on maximum hanger spacing.

**CONNECTIONS:**

Drawings indicate general arrangement of fuel gas piping, fittings, and specialties.

Install piping adjacent to appliances to allow service and maintenance.

Connect piping to appliances using gas with shutoff valves and unions. Install valve upstream from and within 72" (1800 mm) of each appliance. Install union downstream from valve.

Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance using gas.

Ground Equipment:

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
B. Do not use gas pipe as grounding electrode.

**LABELING AND IDENTIFYING:**

Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each service meter, pressure regulator, and specialty valve.

A. Text: In addition to name of identified unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
B. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for nameplates and signs.

**FIELD QUALITY CONTROL:**

Inspect, test, and purge piping according to ANSI Z223.1, Part 4 "Inspection, Testing, and Purging," and requirements of authorities having jurisdiction.

Repair leaks and defects with new materials and retest system until satisfactory results are obtained.

Report test results promptly and in writing to Architect and authorities having jurisdiction.

Verify capacities and pressure ratings of service meters, pressure regulators, valves, and specialties.

Verify correct pressure settings for pressure regulators.

Verify that specified piping tests are complete.

**ADJUSTING:**

Adjust controls and safety devices. Replace damaged and malfunctioning controls and safety devices.

**END OF SECTION**

# 23 34 23 HVAC POWER VENTILATORS

## PART 1 GENERAL

### RELATED DOCUMENTS:

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

### SUMMARY:

This Section includes the following:

A. In-line centrifugal fans.

Related Sections: The following Sections contain requirements that relate to this Section:

A. Division 23 Section "Vibration Control" for vibration hangers and supports.
B. Division 23 Section "Control Systems Equipment" for control devices.
C. Division 26 Section "Disconnects and Circuit Breakers" for disconnect switches.
D. Division 26 Section "Motor Controllers" for motor starters.

Products furnished, but not installed, under this Section include roof curbs for roof-mounted exhaust fans.

### PERFORMANCE REQUIREMENTS:

Project Altitude: Base air ratings on actual site elevations.

Operating Limits: Classify according to AMCA 99.

Fan Unit Schedule: The following information is described in an equipment schedule at the end of this Section.

Fan Unit Schedule: The following information is described in an equipment schedule on the Drawings.

A. Fan performance data including capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
B. Fan arrangement including wheel configuration, inlet and discharge configurations, and required accessories.

### SUBMITTALS:

General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

Product Data including rated capacities of each unit, weights (shipping, installed, and operating), furnished specialties, accessories, and the following:

A. Certified fan performance curves with system operating conditions indicated.
B. Certified fan sound power ratings.

C. Motor ratings and electrical characteristics plus motor and electrical accessories.
D. Material gages and finishes, including color charts.
E. Dampers, including housings, linkages, and operators.

Shop Drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.

Wiring diagrams detailing wiring for power and control systems and differentiating clearly between manufacturer-installed and field-installed wiring.

Maintenance data for power ventilators to include in the operation and maintenance manual specified in Division 1 and in Division 15 Section "Basic Mechanical Requirements."

**QUALITY ASSURANCE:**

Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL where available.

Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.

A. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
B. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

AMCA Compliance: Provide products that meet performance requirements and are licensed to use the AMCA Seal.

NEMA Compliance: Provide components required as part of fans that comply with applicable NEMA standards.

UL Standard: Provide power ventilators that comply with UL 705.

**PROJECT CONDITIONS:**

Field Measurements: Verify dimensions by field measurements. Verify clearances.

Do not operate fans until ductwork is clean, filters are in place, bearings are lubricated, and fans have been commissioned.

**COORDINATION AND SCHEDULING:**

Coordinate the size and location of structural steel support members.

Coordinate the installation of roof curbs, equipment supports, and roof penetrations. Roof specialties are specified in Division 7 Sections.

## PART 2 PRODUCTS

**MANUFACTURERS:**

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

A. In-Line Centrifugal Fans:
   1. Enervex.

**IN-LINE CENTRIFUGAL FANS:**

Description: In-line, direct drive, electronically commutated motor, centrifugal fans consisting of housing, wheel, fan shaft, bearings, drive assembly, motor and disconnect switch, mounting brackets, and accessories. UL 378 and UL 705.

Housing: 316L stainless steel; inlet and outlet flanges; and support brackets.

Direct-Drive Units: Motor encased in housing out of air stream, factory wired to disconnect located on outside of fan housing.

Fan Wheels: 316L stainless steel, airfoil blades welded to 316L stainless steel hub.

Accessories: The following accessories are required as indicated:

A. Modulating pressure controller.

**FACTORY FINISHES:**

Sheet Metal Parts: Prime coat before final assembly.

Exterior Surfaces: Baked-enamel finish coat after assembly.

Aluminum and Stainless Steel Parts: No finish required.

**SOURCE QUALITY CONTROL:**

Testing Requirements: The following factory tests are required as indicated:

A. Sound Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings From Laboratory Test Data." Test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA 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

**EXAMINATION:**

Examine areas and conditions for compliance with requirements of installation tolerances and other conditions affecting performance of the power ventilators. Do not proceed with installation until unsatisfactory conditions have been corrected.

**INSTALLATION:**

Install power ventilators according to manufacturer's written instructions.

Support units using the vibration-control devices indicated. Vibration-control devices are specified in Division 23 Section "Vibration Control."

A. Suspend units from structural steel support frame using threaded steel rods and vibration isolation springs.

Install units with clearances for service and maintenance.

Label units according to requirements specified in Division 23 Section "Mechanical Identification."

**CONNECTIONS:**

Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors.

Electrical: Conform to applicable requirements in Division 26 Sections.

Grounding: Ground equipment. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

**FIELD QUALITY CONTROL:**

Manufacturer's Field Service: Provide services of a factory-authorized service representative to supervise the field assembly of components and installation of fans, including duct and electrical connections, and to report results in writing.

**ADJUSTING:**

Adjust damper linkages for proper damper operation.

Adjust belt tension.

Lubricate bearings.

**CLEANING:**

After completing installation, inspect exposed finish. Remove burrs, dirt, and construction debris, and repair damaged finishes including chips, scratches, and abrasions.

Clean fan interiors to remove foreign material and construction debris. Vacuum clean fan wheel and cabinet.

**COMMISSIONING:**

Final Checks before Startup: Perform the following operations and checks before startup:

A. Verify that shipping, blocking, and bracing are removed.
B. Verify that unit is secure on mountings and supporting devices and that connections for piping, ducts, and electrical components are complete. Verify that proper thermal-

overload protection is installed in motors, starters, and disconnects.
C. Perform cleaning and adjusting specified in this Section.
D. 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.
E. Lubricate bearings, pulleys, belts, and other moving parts with factory-recommended lubricants.
F. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in the fully open position.
G. Disable automatic temperature-control operators.

Starting procedures for fans are as follows:

A. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated RPM.
B. Measure and record motor voltage and amperage.

Shut unit down and reconnect automatic temperature-control operators.

Refer to Division 23 Section "Testing, Adjusting, and Balancing" for procedures for air-handling-system testing, adjusting, and balancing.

Replace fan and motor pulleys as required to achieve design conditions.

**DEMONSTRATION:**

Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.

Review data in the operation and maintenance manuals. Refer to Division 1 Section "Contract Closeout."

Schedule training with Owner, through Architect, with at least 7 days' advance notice.

Demonstrate operation of power ventilators. Conduct walking tour of the Project. Briefly identify location and describe function, operation, and maintenance of each power ventilator.

**END OF SECTION**

# 23 51 00 BREECHINGS, CHIMNEYS, AND STACKS

## PART 1 GENERAL

### RELATED DOCUMENTS:

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

### SUMMARY:

This Section includes the following:

A. Steel, positive-pressure, double-wall vents.
B. Induced-draft fans.

### SUBMITTALS:

Product Data: For each type of product indicated. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

Shop Drawings: Show fabrication and installation details for breechings, chimneys, and stacks. Include plans, elevations, sections, details, and attachments to other Work. Detail assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, hangers and seismic restraints, and location and size of each field connection.

A. Wiring Diagrams: Detail power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.

Welding Certificates: Copies of certificates for welding procedures and personnel.

Engineering Report: Certifying that stacks meet the design wind and seismic loads.

Maintenance Data: For vent fans to include in maintenance manuals specified in Division 1.

### QUALITY ASSURANCE:

Manufacturer Qualifications: A firm experienced in manufacturing refractory-lined stacks similar to those indicated for this Project and with a record of successful in-service performance.

Source Limitations: Obtain Type B vent system components through one source from a single manufacturer.

Welding Standards: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," for hangers and supports, and AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

Comply with AWS D1.1 for welder qualifications, welding details, and workmanship standards.

Comply with SMACNA's "Guide for Steel Stack Design and Construction."

Comply with SMACNA's "HVAC Duct Construction Standards, Metal and Flexible" for fabricated breechings.

## PART 2 PRODUCTS:

### MANUFACTURERS:

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

A. Steel, Positive-Pressure, Double-Wall Vents:
   1. Metal-Fab, Inc.
   2. Selkirk Metalbestos.
   3. Simpson Dura-Vent Co., Inc.
   4. Van-Packer Co.

### STEEL, POSITIVE-PRESSURE, DOUBLE-WALL VENTS:

Description: Double-wall metal stacks complying with NFPA 211, suitable for use with building heating equipment burning gas, solid, or liquid fuels.

Construction: Inner and outer metal shells separated by at least 1/2-inch (13-mm) airspace, with positive sealing joints.

Construction: Inner and outer metal shells separated by at least 1-inch (25-mm) airspace, with positive sealing joints.

Inner Shell: ASTM A 666, Type 304 stainless steel of the following thicknesses:

A. 6" to 36" (152- to 914-mm) Size: 0.035 inch (0.89 mm) thick.
B. 42" to 48" (1067- to 1220-mm) Size: 0.048 inch (1.22 mm) thick.

Outer Jacket: Aluminum-coated steel of the following thicknesses:

A. 6" to 24" (152- to 610-mm) Size: 0.025 inch (0.64 mm) thick.
B. 26" to 48" (660- to 1219-mm) Size: 0.034 inch (0.86 mm) thick.

Accessories: Tees, elbows, increasers, draft hood connectors, termination, adjustable roof flashing, storm collar, support assembly, thimbles, firestop spacers, and fasteners; fabricated of similar materials and designs as vent-pipe straight sections.

Termination: Round chimney top designed to exclude 98 percent of rainfall.

### GUYING AND BRACING MATERIALS:

Cable: Galvanized, stranded wire of the following thickness:

A. Minimum Size: 1/4 inch (6 mm) in diameter.
B. For ID Sizes 4 to 15 Inches (100 to 381 mm): 5/16 inch (8 mm) in diameter.
C. For ID Sizes 18 to 24 inches (457 to 610 mm): 3/8 inch (9.5 mm) in diameter.
D. For ID Sizes 27 to 30 inches (685 to 762 mm): 7/16 inch (11 mm) in diameter.
E. For ID Sizes 33 to 36 inches (838 to 915 mm): 1/2 inch (12.7 mm) in diameter.
F. For ID Sizes 39 to 48 inches (990 to 1220 mm): 9/16 inch (14.3 mm) in diameter.
G. For ID Sizes 51 to 60 inches (1295 to 1524 mm): 5/8 inch (16 mm) in diameter.

Pipe: 1-1/4-inch- (32-mm-) diameter, galvanized steel.

Angle Iron: Galvanized steel 1-1/2 by 1-1/2 by 3/16 inch (380 by 380 by 4.8 mm).

## PART 3 EXECUTION

### INSTALLATION OF MANUFACTURED BREECHINGS, CHIMNEYS, AND STACKS:

Install according to manufacturer's written instructions. Locate to comply with minimum clearances from combustibles.

Install, support, and restrain according to requirements of seismic zone.

Seal between sections of positive-pressure vents according to manufacturer's written installation instructions, using sealants recommended by manufacturer.

Support vents at intervals recommended by the manufacturer to support weight of vent and all accessories, without exceeding loading of appliances.

A. Where maximum unsupported lengths of stack are exceeded, support chimneys as follows:
   1. Guy wires.
   2. Rigid pipe braces.
   3. Rigid angle-iron braces.

### INSTALLATION OF DAMPERS:

Install barometric and thermostatically operated dampers according to manufacturer's written instructions. Locate as close to draft hood collar as possible.

### INSTALLATION OF FANS:

Install fans according to manufacturer's written instructions.

Secure fans to appliances, breechings, or stacks with hardware matching connected materials.

Install units with clearances for service and maintenance.

### CLEANING:

After completing system installation, including terminals, inspect exposed finishes. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

Clean breechings internally, during and on completion of installation, to remove dust and debris. Clean external surfaces to remove welding slag and mill film. Grind welds smooth.

Provide temporary closures at ends of breechings and chimneys that are not completed or connected to equipment.

**COMMISSIONING:**

Engage a factory-authorized service representative to perform startup service for fans.

Verify that fans are installed and connected according to the Contract Documents.
Complete installation and startup checks according to manufacturer's written instructions, and confirm fan interlocks.

**DEMONSTRATION:**

Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fans as specified below:

A. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining fans.
B. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
C. Schedule training with Owner, through Architect, with at least seven days' advance notice.

**END OF SECTION**

# SECTION 260500 – COMMON WORK RESULTS FOR ELECTRICAL

## PART 1 - GENERAL

### 1.1 GENERAL CONDITIONS:

A. The General Conditions, Supplementary General Conditions, General Requirements, and Special Conditions shall be and are hereby made a part of this Section of the specifications.

B. In case of conflicts between the electrical drawings and Division 26 of these specifications, the more stringent requirements shall govern. In all cases, notify the Engineer for direction.

C. The requirements of SECTION 26 05 00 - BASIC METHODS AND REQUIREMENTS establish minimum requirements, apply to, and are hereby made a part of all sections of Division 26 of this specification.

D. The Contractor shall be responsible for excavation of all earth, soil, and rock conditions at the site. Review the elevations and soil boring logs and include all associated costs.

E. Unless noted otherwise on the Drawings, or elsewhere in Division 26 Specifications, the singular words ‘Provide’, ‘Furnish’, or ‘Install’ noted on the drawings or in these Specifications shall mean to completely furnish, install, and connect each item, and if such is a part or component of a system the entire system shall be functional with all items and components provided. Unless noted otherwise on the Drawings, or elsewhere in Division 26 Specifications, any reference to ‘wiring’ noted on the drawings or in these Specifications shall mean both raceways and conductors or cables.

### 1.2 DESCRIPTION:

A. The electrical work shall include all labor, materials, tools, transportation, equipment, services and facilities, required for the complete, proper and substantial installation of all electrical work shown on the plans, and/or outlined in these specifications. The installation shall include all materials, appliances, and apparatus not specifically mentioned herein or noted on the drawings but which are necessary to make a complete working installation of all electrical systems.

B. All of the electrical related work required for this project (unless specified otherwise) is a part of the Electrical Contract price but is not necessarily specified under this division of the specifications or shown on the electrical drawings. Therefore, all divisions of the specifications and all drawings shall be consulted.

C. The floor plan drawings are schematic only and are not intended to show the exact routing of raceway systems between devices, lighting, and equipment unless dimensions are noted on the drawings. Routing of raceways overhead or below floor shall be as shown on the drawings, unless approved otherwise by the

Engineer. Final routing of raceway systems between devices, lighting, and equipment will be governed by field conditions (structural members, mechanical equipment, ductwork, etc.) and shall be determined by the Contractor and approved by the Architect. Any changes in routing shall not change the design of the raceway system.

D. The floor plan drawings showing device and equipment locations are schematic only and are not intended to show exact locations unless dimensions are noted on the drawings. The Contractor shall review all contract drawings that may affect the location of devices and equipment to avoid possible interference and permit full coordination of all work. The right to make any reasonable change in location within 6'-0", is reserved by the Architect up until the time of rough-in at no extra cost.

E. Furnish and install electrical wiring, systems, equipment and accessories in accordance with the specifications and drawings. Capacities and ratings of transformers, cable, switchgear, panelboards, motor control, and other items, arrangement for specified items in general are shown on drawings.

F. Electrical service entrance equipment (arrangements for temporary and permanent connections to the power company's system) shall conform to the power company's requirements. Coordinate fuses, circuit breakers and relays with the power company's system, and obtain power company approval. Provide all required temporary building power and lighting. Remove when finished. Installation of temporary power and lighting shall comply with N.E.C. and OSHA requirements.

G. Ampacities specified or shown on the drawings are based on copper conductors, with EMT conduit accordingly sized. If other conduit or raceway types are used, adjust conduit or raceway sizes accordingly.

H. This Contractor shall coordinate his work under this division of the specifications with the work of other trades wherein it may be interrelated. His work shall be done in such an order that there will be no interference in installing, nor delay in completion, of any part or parts of each respective trade, thereby permitting all construction work to proceed in its natural sequence without unnecessary delay.

I. Before submitting his bid, the Contractor shall familiarize himself with the rules of all governing bodies having jurisdiction and shall notify the Architect in submitting his bid, if in his opinion, any work or material specified is contrary to such rules. Otherwise, the Contractor shall be responsible for the approval of all work and materials and, in case the use of any material specified is not permitted, a substitute shall be approved by the Engineer and shall be provided at no increase in cost.

J. The drawings have been prepared to cover all electrical work under this contract. The Contractor is referred to all other contract drawings to guide him in the proper installation of his work.

K. The Contractor shall fully familiarize himself with the floor drawings, elevations, details of construction, feeders, fixtures, conduit, wiring, service, etc., insofar as it may affect the installation of the work under this specification in order that all necessary materials and labor may be provided even though not specifically referred to on the drawings or called for in the specifications.

L. As the drawings are generally diagrammatic, the final layout of the work shall be subject to the approval of the Architect but the Contractor shall be responsible without increase in contract price for the coordination of all work under various divisions of the specifications.

M. This Contractor shall confer with other Contractors installing work which may affect his work and must arrange his conduit, etc., in proper relation to such work. Any damage resulting from his neglect to do so must be paid for by the Contractor.

N. Where necessary to fit and center with paneling of ceilings and wall spaces, the Contractor must, at his own expense, shift the lighting outlets or other outlets as required by the Architect.

O. All outlets shall be set in such a manner as to finish flush with wall and ceiling lines unless marked to be exposed or surface mounted on the drawings. The height of brackets, switches, outlets, etc., are to be as directed.

P. The Electrical Contractor shall confirm the exact electrical requirements for all equipment supplied by others and installed or connected by the Electrical Contractor. The specific work performed for the installation of any equipment shall be in conformance with the requirements established by the shop drawings of the equipment supplied. In the event the shop drawings establish requirements distinctly different than the requirements shown in the contract documents, the Contractor shall be entitled only to an adjustment of the difference between the work shown and the work required with full credit for labor and materials shown on the original drawings.

Q. The Electrical Contractor shall provide all trenching and backfilling for underground conduits. Unless noted otherwise in other divisions of these specifications, all trenches shall be backfilled and compacted with material defined by the United Soil Classification as ML or CL (silt and clay of low to medium plasticity). Compaction shall be to 90% of ASTM D698.

1.3 MINIMUM REQUIREMENTS:

A. Codes Rules and Regulations: Execute all work under ADA, the latest rules and regulations of the National Electrical Code Standard of the National Board of Fire Underwriters, the National Fire Protection Association, and with all laws, regulations and ordinances of the County, State, City, and the Utility Company.

B. Codes shall govern in case of any direct conflict between codes, plans and specifications; except when plans and specifications require higher standards than those required by code. Variance from the plan and specifications made to comply with code must be approved by the Architect. If approved they shall be made with no increased cost to the Owner.

C. This Contractor shall provide and install only the brands of materials and equipment specified herein, or equipment approved by written addendum by the Architect-Engineer as equal. All material and equipment shall be listed and labeled by Underwriters Laboratories, Inc., indicating compliance with nationally recognized standards and/or tests.

1.4 STANDARDS:

A. All material and equipment shall be listed, labeled or certified by Underwriters Laboratories, Inc., where such standards have been established. Equipment and material which are not covered by UL Standards will be accepted provided equipment and material is listed, labeled, certified or otherwise determined to meet safety requirements of a nationally recognized testing laboratory. Equipment of a class which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe, will be considered if inspected or tested in accordance with national industrial standards, such as NEMA, or ANSI. Evidence of compliance shall include certified test reports and definitive shop drawings.

B. Definitions:
1. Certified: Equipment is "certified" if:
a. Equipment has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards, or to be safe for use in a specified manner.
b. Production is periodically inspected by a nationally recognized testing laboratory.
c. It bears a label, tag, or other record of certification.
2. Nationally recognized testing laboratory: A testing laboratory which is approved, in accordance with OSHA regulations, by the Secretary of Labor.

1.5 QUALIFICATIONS (PRODUCTS AND SERVICES):

A. Manufacturers Qualifications: The manufacturer shall regularly and presently produce, as one of the manufacturer's principal products, the equipment and material specified for this project, and shall have manufactured the item for at least three years.

B. Product Qualification:
1. Manufacturer's product shall have been in satisfactory operation, on three installations of similar size and type as this project, for approximately three years.
2. The Engineer reserves the right to require the Contractor to submit a list of installations where the products have been in operation before approval.

C. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will respond within two hours of receipt of notification that service is needed. Submit name and address of service organization.

1.6 MANUFACTURED PRODUCTS:

A. Materials and equipment furnished shall be new, of best quality and design, free from defects, of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts should be available. All items used on this project shall be free of asbestos, PCB, and mercury material.

B. When more than one unit of the same class of equipment is required, such units shall be the product of a single manufacturer.

C. Equipment Assemblies and Components:
   1. Components of an assembled unit need not be products of the same manufacturer unless indicated otherwise.
   2. Manufacturers of equipment assemblies, which include components made by others, shall be completely responsible for the final assembled unit.
   3. Components shall be compatible with each other and with the total assembly for the intended service.
   4. Constituent parts which are similar shall be the product of a single manufacturer.

D. Factory and Field wiring shall be identified on the equipment being furnished and on all wiring diagrams.

E. When Factory Testing is Specified:
   1. The Engineer shall have the option of witnessing factory tests. The Contractor shall notify the Engineer a minimum of 15 working days prior to the manufacturer making the factory tests.
   2. Four copies of certified test reports containing all test data shall be furnished to the Engineer prior to final inspection and not more than 90 days after completion of the tests.
   3. When equipment fails to meet factory test and re-inspection is required, the Contractor shall be liable for all additional expenses, including expenses of the Engineer.

1.7 EQUIPMENT PROTECTION:

A. Equipment and material shall be protected during shipment and storage against physical damage, dirt, moisture, cold and rain. Temporary raceways shall be kept closed and all raceways shall be installed clean and free from dirt and grease.

B. During installation, equipment, controls, controllers, circuit protective devices, and other like items, shall be protected against entry of foreign matter and be vacuum cleaned both inside and outside before testing, operating and painting.

C. Damaged equipment shall be, as determined by the Engineer, placed in satisfactory operating condition or be returned to the source of supply for repair or replacement.

D. Painted surfaces shall be protected with factory installed removable heavy Kraft paper, sheet vinyl or equal.

E. Damaged paint on equipment and materials shall be restored to the original quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

1.8 PROTECTIVE DEVICE COORDINATION STUDY

A. Any project that has breakers that are provided with an adjustable trip setting, those settings must be provided with a coordination study that is provided by the gear manufacturer. The coordination study shall include a time-current curve drawing with recommended settings. The coordination study shall be provided with

the gear submittal congruently. The contractor shall be responsible for adjusting the breaker settings to match the coordination study suggestions. If the gear manufacturer does not provide a coordination study, then the electrical contractor shall hire Integrated Consulting Engineers, Inc. to provide the coordination study and respective circuit breaker settings.

1.9 GENERAL WORK REQUIREMENTS:

A. Arrange, phase and perform work to assure electrical service both temporary and permanent for buildings at all times.

B. Coordinate location of equipment and conduit with other trades to minimize interference.

C. Examination of Site:
1. Visit the site, inspect the existing conditions and check the drawings and specifications so as to be fully informed of the requirements for completion of the work.
2. Lack of such information shall not justify an extra to the contract price.

D. Permits:
1. Obtain and pay for all licenses and permits, fees, inspection and certificates required for the execution of this work.
2. Pay fees and charges for connection to outside services and use of property.
3. Deliver permits and certificates to the Architect to be transmitted to the Owner.

E. Services:
1. This Contractor shall pay for all expenses, deposits, reimbursements, etc., required by the local rules and codes for the service to the buildings, complete and ready for use.
2. Consult power company for their requirements and for coordinating with their installation. Contractor shall provide any work thus required beyond that indicated by drawings and/or specifications and pay for costs incurred for Utility Company to install both temporary and permanent service to the project. All temporary wiring shall be installed per the National Electrical Code. Verify costs with Utility Co. prior to bidding. Verify complete installation and locations of pad mount or pole mount transformers with the local electric utility company and bid installation to comply with their requirements. Contractor shall provide guard posts around electrical transformers and electrical pedestals per Utility Company standards. Contractor shall provide warning tapes above primary and secondary conduits per National Electrical Code. Verify routing of primary and secondary conduits with Utility Co. prior to installation.
3. This Contractor shall consult all local departments to verify requirements and bid installation of service in accordance with local codes and Utility company rules and regulations.
4. This Contractor shall bear all expense involved for the complete telephone service conduit installation and pull wire ready for cable installation. Verify complete installation with the local telephone company and bid installation to comply with their requirements.

F. Main Service:
   1. Primary: Coordinate with local electric utility provider
   2. Secondary: See the plans. Voltage will be, 277/480-volt, 3-phase, 4-wire, WYE, 120/208-volt, 3-phase, 4-wire, WYE, 240-volt, 3-phase, 3 wire Delta, or 120/240-volt, 1-phase, 3 wire.

G. Responsibility:
   1. This Contractor will be held responsible for any and all damage to any part of the building or to the work of other contractors, as may be caused through this contractor's operation.

   2. Any mutilation of building finishes or equipment initiated by electrical construction shall be properly corrected by the respective finishing contractor and paid for by the Electrical Contractor.
   3. The operation of the temporary power and the permanent electrical system shall be the responsibility of this Contractor until acceptance of the building by the Owner.

H. Work to be done by the General Contractor:
   1. Build in all openings, sleeves, chases, etc., for conduit and equipment as established, furnished and set by this Contractor. The General Contractor shall seal or grout all openings after this Contractor has installed the conduits.
   2. Build in bolts, brackets, hangers etc., for work established, furnished and set by this Contractor.
   3. All concrete work required for equipment furnished and set by this Contractor including clean up pads under electrical gear, fixture bases, transformer bases, etc.
   4. Painting: All painting of electrical equipment installed in finished areas shall be done by the General Contractor. Painting will not be required on receptacles, switches, circuit breakers etc. All fixtures and exterior poles specified to be factory-primed shall be painted by General Contractor. Paint all Wiremold, exposed conduit and equipment, etc., to match final wall or ceiling colors.
   5. Provide fireproofing above fixtures located in fire rated ceilings per U.L. requirements.
   6. Pay all utility costs for operation of electrical system during construction until acceptance of building by the Owner.

I. Work to be done by the Mechanical Contractor:
   1. The Mechanical Contractor shall furnish wiring diagrams and temperature control drawings of all equipment furnished to the Electrical Contractor. (Catalog information is unacceptable, provide point to point drawings.).
   2. The Mechanical Contractor shall furnish and install all control equipment requiring connections to air, water, steam, etc., such as pneumatic electric relays, remote bulb temperature controls, solenoid valves, aquastats and pressure controls.
   3. The Mechanical Contractor shall reimburse the Electrical Contractor for any changes in system design i.e.; control or equipment which affects the Electrical Contractor. Also refer to equipment connections, controls and instrumentation in 26 05 00.

J. Workmanship and coordination:
   1. Make installation substantially as shown on the plans.

2. Make alterations in location of apparatus or conduit as may be required to conform to building construction without extra charge.
3. Mechanical equipment service clearances and electrical apparatus service clearances as specified in their respective manufacturer's product data shall be maintained free from conduit.
4. Cooperate with other trades in their installation of work.
5. Complete the installation in a workmanlike manner, completely connected and ready to give proper and continuous service.
6. Use only experienced licensed electricians.

K. Cutting and patching:
1. Notify the General Contractor in ample time, of the location of all chases, sleeves, and other openings required in connection with the work of this contract.
2. Cutting and patching made necessary because of failure to comply with the above shall be done by the General Contractor at the expense of the Electrical Contractor.
3. When it is necessary for the Electrical Contractor to cut building materials, it shall be done in a neat and workmanlike manner meeting with the approval of the Architect and by the mechanics of the particular trade involved.
4. Holes through concrete shall be carefully drilled with a "Concrete Termite" drill. A Star Drill or Air Hammer will not be permitted. Structural members shall not be cut without approval from the Architect.
5. Any penetrations through the roof shall be made with "Stoneman" flashing connections as manufactured by Stoneman Engineering and Manufacturing Co., Inglewood, Calif., or as approved by the Architect.
6. Any penetrations made in exterior or basement foundation walls shall be sealed with Thunderline "Link-Seal" connections, as manufactured by Thunderline Corporation, Wayne, Michigan.
7. Any holes or voids created in floors, ceilings and walls, including any spaces or gaps around conduit or equipment passing through such areas, which compromise the applicable rating of the floors, ceilings or walls, shall be sealed with an intumescent material equal to "3M Fire Barrier Caulk, Putty or Strip Sheet", "Carborundum Fiberfrax Fyre Putty", "Tremco X-ferno Fire Products", or “Rectorseal Metacalk”. Material equal to the above and meeting U.L. 1479 may be used. All installations shall be per manufacturer's exact instructions.

L. Manufacturers instructions:
1. Apply, install, connect, erect, use, clean, and condition articles, materials and equipment as directed by the manufacturer.

M. Temporary electrical:
1. Make arrangements with electric utility for temporary service.
2. Provide materials, equipment, labor to install, modify, maintain (and upon completion of project, remove) safe temporary electrical power and lighting systems per OSHA standards and NEC requirements.
3. Provide sufficient capacity for construction tools, equipment, temporary ventilation and lighting.
4. Distribute systems throughout building and construction area of site such that an extension cord no longer than 100' will reach any work area. Open branch systems permitted where permitted by the National Electrical Code and OSHA. Provide temporary services to all construction offices as required.

5. Employ permanent systems as they are completed and available.
6. Provide metering of temporary service. All temporary utility costs will be paid by the Contractor.
7. All temporary electrical services shall be removed within 30 days after completion of the building, or 30 days after the premises are used or occupied for which the temporary permit was issued.

N. Demolition:
1. Where remodeling and renovation work is a part of the project, the following shall apply, unless noted otherwise on the drawings:
   a. All items noted to be removed shall be removed complete back to point of supply including conductors and exposed lengths of conduit and raceways. Any raceways removed that are routed into the floor shall be cut off flush with the floor surface and the floor patched for a flat smooth floor surface. All items to remain on circuits where other items are noted to be removed shall be re-circuited as required to maintain continuity of circuit or system. All light fixtures, equipment, receptacles, devices, fire alarm and nurse call devices, door security devices, and sound system devices noted to be removed and not relocated shall be offered to the Owner. If the Owner elects not to retain these items, they shall become Contractor salvage and shall be removed from the job site. The Contractor shall remove from the job site all other items noted to be removed (verify all items with Owner). Where existing flush mounted devices are noted to be removed from walls to remain, remove device, coverplate, and conductors and install blank cover plate over flush backbox. Electrical Contractor shall remove existing coverplates for all existing devices to remain in remodeled and renovated areas that will receive new wall finishes and reinstall cover plates after new wall finishes are complete. All existing light fixtures and devices not shown or indicated otherwise on the drawings in existing areas are to remain.
   b. Electrical Contractor shall remove all existing light fixtures, devices and wiring from all existing walls, partitions, and ceilings to be removed, and shall remove all existing light fixtures and wiring in rooms where new lighting is shown, unless noted otherwise on the drawings.
   c. Electrical Contractor shall review all specifications and all drawings to coordinate installation of new equipment and devices of other trades with existing conditions. Remove and relocate existing raceways, conductors, and boxes as required for installation of new equipment or devices.
   d. Schedule all downtimes associated with any new service revisions a minimum of one (1) week prior to interruption of services. No interruptions of any electrical work shall be made without prior consent of the Owner. Contractor shall submit to the Owner a schedule of downtimes for the Owners review and approval.

1.10 EQUIPMENT INSTALLATION AND REQUIREMENTS:

A. The Contractor shall obtain from the Architectural and Structural drawings the exact location and size of spaces available for his apparatus and material and shall install them accordingly. In case the space allowed is not sufficient, or an obstruction interferes with placing them as shown or specified, the Contractor shall

obtain instructions from the Architect and shall install them as directed without extra charge. These provisions refer only to exactness of positions that cannot be determined from the drawings and do not permit placing apparatus distinctly different from that shown on the drawings.

B. Working spaces shall not be less than specified in the National Electrical Code for all voltages specified.

C. Inaccessible Equipment:
1. Where the Engineer determines that the Contractor has installed equipment without proper clearances or not readily accessible for operation and maintenance, equipment shall be removed and reinstalled as directed at no additional cost to the Owner.
   a. Install access panels as approved by the Architect to provide access to all equipment, J-boxes and outlets located in non-accessible spaces. Panels shall be flush locking type with a fire rating equal to the ceiling system.
2. "Conveniently accessible" is defined as being capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping, and ductwork. Outlet and box covers shall be removable by using regular length (8") screw drivers.

D. Distribution Equipment:
1. All items of Electrical Distribution Equipment (switchboards - panelboards - disconnects) shall be of one manufacturer, unless specifically noted on the drawings, in the specifications, or approved by written addendum by the Engineer. Intermixing of distribution equipment by different manufacturers will not be permitted.
2. If shown on the drawings, provide a surge arrester for lightning protection on each service entrance for each building. Refer to drawings for voltage and phasing of service. Arrester shall be located within or adjacent to the main switch, panel or switchboard enclosure and connected with 12” maximum leads. Surge Arrester shall be equal to Current Technology SEL200-DM-L3 Series.
3. Equipment layouts on the drawings are based on one manufacturer. Verify all actual equipment sizes with equipment manufacturer prior to bidding.
4. If layout changes are required due to differing electrical manufacturers equipment size, they must be submitted to and approved by the Engineer. National Electric Code working clearances must be maintained at all times. Extra remuneration will not be allowed for layout changes that differ from those shown.
5. Provide and install all steel supports as required for mounting of electrical equipment.
6. Anchor all free standing electrical equipment including switchboards, switchgear, substations, motor control centers, paralleling gear, transfer switches, transformers, etc. to the floor with plated, 1/2" diameter minimum, anchor bolts or as recommended by the manufacturer.

1.11 EQUIPMENT CONNECTIONS, CONTROLS AND INSTRUMENTATION:

A. General: The following applies to all electrical power and control connections for all equipment requiring electrical installation work provided by others.

B. The Electrical Contractor shall furnish, install and connect all wiring, conduit, boxes, toggle switches, thermal switches, disconnect switches, remote push-button stations not included in magnetic starters, etc., for all equipment requiring electrical power that is furnished by other contractors and/or the Owner, as required for a complete and operating system. The Electrical Contractor shall receive, install and connect all magnetic starters and controllers, capacitors, power factor correction devices, transformers, alarms, bells, horns, relays, remote switches, etc., for equipment supplied by others, (i.e. starters, capacitors or power factor correction devices for mechanical equipment, etc.). In general all major equipment will be specified to be factory prewired with only service and interlocking required at the site by the Electrical Contractor; however he shall check all divisions of the specifications to verify if the equipment is specified factory prewired and if not, then it shall be the responsibility of the Electrical Contractor to provide the complete wiring of the equipment in accordance with wiring diagrams, and temperature control drawings provided by the other contractors and/or the Owner, to the Electrical Contractor. All interlocking of equipment shall be by the Electrical Contractor.

C. All line and low voltage wiring and connections required to control the equipment and/or dampers are a part of this section. All wiring shall be in conduit. Provide and install line or low voltage wiring to all dampers as required for system operation. All low voltage wiring, conduit, connections and/or terminations are by the Electrical Contractor unless specifically noted otherwise within the bidding documents.

D. The Electrical Contractor shall provide to each Mechanical Control Panel a 120 volt control power supply; #12 Ga. CU. THHN/THWN in 1/2"C. minimum at all points required by controls, instrumentation and sprinkler risers. Circuit as shown on the plans or to the nearest 120 volt panel if no circuiting is indicated. Provide 20 Amp. breakers unless otherwise indicated. Each control panel shall be on a separate circuit unless otherwise indicated. If the controlled equipment is fed from the emergency system, then the control power supply must feed from the emergency system. Electrical Contractor to provide at each Mechanical Control Panel a CAT 6 drop as required, coordinate with mechanical contractor.

E. The Contractor shall become familiar himself with the equipment to be furnished by the other Contractors and/or the Owner in connection with this work and include provisions for such connections and work in the Contractor's price. Extra remuneration will not be allowed for such work.

F. Connections to all equipment have been designed from units as specified on the drawings or in the specifications. In the event equipment or control differs on approved shop drawings it shall be the responsibility of the Supplying Contractor to coordinate electrical connections to the units and reimburse Electrical Contractor for any changes in system design. These changes shall not involve additional cost to the Owner.

G. Review all plans, specifications, and approved shop drawings of all trades to verify all equipment connections that are required by mechanical and/or other contractors. Although the electrical drawings will show equipment connection requirements, it is the Electrical Contractor's responsibility to connect all equipment furnished by other Contractor's at no extra cost to the Owner, even if this equipment connection is not shown on the electrical drawings. Coordinate all required connections not shown on the electrical drawings with the Engineer.

H. Electrical Contractor to provide and install all boiler remote shut down switches and chiller remote shut down switches as required by Codes. Connect to equipment as required. Install nameplates at switches indicating use. Mount switches at 4'-0" AFF.

I. Service receptacles and disconnect switches mounted on mechanical equipment shall be located as not to obstruct access doors to equipment. Provide weatherproof-in-use covers on receptacles at exterior HVAC units, whether or not the receptacles are furnished with the equipment.

J. All power burner boilers or boilers with a BTUH input of 400,000 or more shall be provide with a manually operated emergency shut off switch. This includes units designated as water heaters that meet these requirements. The emergency shutdown switch shall be installed by each exit from the associated room the equipment is located in and labeled accordingly. Location to be per code requirements. The emergency switch shall disconnect power to the burner controls per the manufacturer’s recommendations. Provide all required switch(es), contactor(s), interconnection, etc. as required to give a complete and functional system.

1.12 NAMEPLATES:

A. General: The following items shall be equipped with nameplates:
   1. Disconnect switches (fused or nonfused), transformers, switchgear, switchboards, panelboards, separately mounted circuit breakers, starters, contactors, relays, junction boxes and pull boxes.
   2. Special Electrical Systems (fire alarm, sound system, emergency system, etc.) shall be so identified at junction and pull boxes, terminal cabinets and equipment racks with a permanent, waterproof means of identification. (Example – FIRE ALARM). Free hand lettering or adhesive tape type label markers will not be acceptable.
   3. Wall switches or other control devices controlling equipment or special lighting configuration shall have either engraved wall plates or shall be provided with engraved nameplates.
   4. All devices on the emergency system shall be 'Red' with coverplates to match remainder of devices in the building. Coverplate to be engraved with panel name and circuit number.

B. Inscription: Nameplates shall adequately describe the function or use of the particular equipment involved. Nameplates for panelboards and switchboards shall include the panel designation, voltage, phase, A.I.C. rating of the devices, color coding of conductors, and location that panel is fed from. (See schedules, one-line diagram, and conductor color coding). For example, "Panel A 120/208 V, 3-Phase,

4-Wire, 10,000 A.I.C. Phase A: Black, Phase B: Red, Phase C: Blue, Neutral: White, Ground: Green, Fed From Panel MDP".

The name used for a machine nameplate shall be the same as the one used on the machine's motor starter, disconnect and P.B. station nameplates. Nameplates for fused switches and panels shall also indicate fuse type and size. All panelboards fed from the emergency system shall be labeled "Emergency System", in addition to the instructions listed above.

C. Construction: Nameplates shall be laminated phenolic plastic white front and back with black core. Nameplates for emergency system panelboards and transfer switch shall be laminated phenolic plastic red front and back with white core. Lettering shall be engraved through front layer to form 1/4" black characters. Nameplates shall be securely fastened to the equipment to be identified, with No. 4 Phillips, round head, cadmium plated, steel self tapping screws or nickel plated brass bolts. Motor nameplate may be nonferrous metal not less than 0.03 inches thick, die stamped. In lieu of separate plastic nameplates, engraving directly on device plates is acceptable. Letters engraved thus, shall be filled with contrasting enamel. All nameplates and their installation are part of this work. Free hand lettering or Dymo Label marker will not be acceptable.

1.13 MATERIALS OF APPROVED EQUAL:

A. Where items of equipment and/or materials are specifically identified herein by a manufacturer's name, model or catalog number, only such specific items may be used in the base bid, except as hereinafter provided.

B. Unless requests for changes in base bid specifications are received, approved and noted by written addendum prior to the opening of bids, the successful contractor will be held to furnish specified items.

C. After contract is awarded, changes in specifications shall be made only as defined under "Substitution of Equipment".

1.14 SUBSTITUTION OF EQUIPMENT:

A. After execution of the contract, substitution of equipment of makes other than those specifically named in the contract documents, may be approved by the Engineer, only if the equipment named in the specifications cannot be delivered to the job in time to complete the work in proper sequence and due to conditions beyond control of the Contractor. Provide documentary proof in writing from the manufacturer that the specified equipment will not be available in time. If the Contractor is responsible for the delay, the substitution will not be approved.

B. Requests for substitutions must be accompanied by documentary proof of equality or difference in price and delivery, if any, in form of certified quotations from suppliers of both specified and proposed equipment.

C. The Owner shall receive all benefits of the difference in cost involved in any substitution, and the contract altered by change order to credit Owner with any savings so obtained.

1.15 SUBMITTALS: In accordance with Section SAMPLES AND SHOP DRAWINGS, Contractor shall, within 15 days after award of contracts, begin sending to the General Contractor for review submittals containing the following:

A. The Engineer's approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage or installation of equipment or material which has not had prior approval will not be permitted at the job site.

B. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings and other data necessary for the Engineer to ascertain that the proposed equipment and materials comply with specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment being submitted.

C. Submittals shall be complete and submitted together for each section. Individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assemble as a whole. Partial submittals will not be considered for approval.
1. Mark the submittals, "SUBMITTED UNDER SECTION ". Mark out all statements on sheets that do not apply otherwise. The Engineer may select options and equipment not originally specified. All options that are not marked out will be assumed that the Contractor will furnish the same.
2. Submittals shall be marked to show specification reference including the section and paragraph numbers.
3. Submit each section separately.
4. Mark catalog cuts to indicate equipment, capacities, finishes, sizes, etc. Each individual item shall have its own sheet provided for approval. (Example: Separate sheets for each panelboard.)

D. The submittals shall include the following:
1. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, pictures, nameplate data and test reports as required.
2. Elementary and interconnection wiring diagrams for communication and signal systems, control system and equipment assemblies. All terminal points and wiring shall be identified on wiring diagrams.
3. Parts list which shall include those replacement parts recommended by the equipment manufacturer, quantity of parts, current price and availability of each part.
4. Quantities of materials will not be verified by the Architect or Engineer. Review stamp on shop drawings does not constitute review of quantities listed on shop drawings.
5. Shop drawings:
a. All shop drawings shall be checked and signed by this contractor and general contractor prior to submittal to the Architect/Engineer. Equipment, materials, etc., not meeting specifications and/or drawing

requirements shall be returned to the supplier for corrections before they are submitted to the Architect-Engineer. This Contractor is reminded that only those materials specified, approved or otherwise indicated by the project specifications, drawings, or addenda will be permitted to be used in constructing the electrical work for this project. The first review of submittals (shop drawings) will be provided as indicated at no charge to the Contractor. However, subsequent review(s) of resubmittals required by "Rejected" status from the original review will necessitate the Electrical Contractor being charged by the electrical consultant a fee of $65 per man-hour, with a minimum charge of $100 for each item resubmitted. It is intended that all electrical submittals be made in a complete and timely fashion such as to permit a comprehensive and thorough review of same.

b. Shop drawings submitted without Contractor's signatures or approval and verification will not be approved.

c. Shop drawings shall be submitted on wire, cables, devices, lighting fixtures (including distribution curves), motor starters, panelboards, disconnects, substations, transformers, switchgear, switchboards, motor control centers, conduit, raceway systems, all systems, etc.

6. Each sheet shall be either 8 1/2" x 11"; 8 1/2" x 13"; or 11" x 17" bond with a 5" x 3" clear area for engineer's stamp. (This area shall not be used by this contractor or the general contractor's stamp.) Larger drawings shall be able to be blue printed.

7. Submittals for all systems (fire alarm, security, PA, controls, sound, clock, nurses call, intercom, etc.) shall include complete riser diagrams showing all conductors and conduit sizes.

E. Engineer's acceptance of Compliance Submittals will not relieve the Contractor from his responsibility for any deviations from the requirements of the contract documents, unless Contractor has in writing called Engineer's attention to such deviation at the time of submission and the Engineer has given written approval to the specific deviation; nor shall any acceptance by Engineer relieve Contractor from responsibility for errors or omissions in Compliance Submittals.

F. Quantity of Submittals: See the general specification sections.

1.16 ELECTRICAL WORK COMPLETION:

A. Before requesting final inspection the following work must be completed.

B. Operating Instructions:

1. The Contractor shall submit along with the shop drawings of the equipment, four (4) copies of operating instructions for all items. Instructions shall be prepared by the manufacturer of the equipment.

2. After the operating instructions have been approved by the Engineer, the Contractor shall include the four (4) copies in maintenance instructions brochures.

3. The Contractor shall also obtain all manufacturer's instructions, manuals, and one complete set of drawings and turn these over to the Architect at the completion of the project.

4. The Contractor shall keep in a safe place, all keys and special wrenches furnished with equipment under this contract and shall give same to the Architect at the completion of the project.
5. The Contractor shall prepare four (4) complete brochures covering all systems and equipment furnished and installed under his contract. Brochures shall be submitted to the Architect-Engineer for approval and delivery to the Owner. The Engineer will retain one copy. The cost of this brochure shall be included in the contract cost. Brochures shall contain the following:
   a. Certified equipment drawings and/or catalog data clearly marked for equipment furnished as required for approval submission under detailed section of the specifications.
   b. Complete operating and maintenance instructions for each item of equipment.
   c. Complete part list for each equipment item.
   d. Any special emergency operating instructions or a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to the various parts of the system.
   e. Reviewed shop drawings with reviewed stamp of Engineer.
   f. System test reports.
6. Brochures shall be bound in hard backed three ring binders with an index, sub-dividers and reinforced sheets.
   a. Project name, and address, and date of submittal.
   b. Section of work covered by brochure, i.e., "Electrical Work".
   c. Name and address of Architect.
   d. Name and address of Engineer.
   e. Name and address of Contractor.
   f. Telephone number of Contractor, including night or emergency number.
7. In addition to these written instructions, each respective Contractor shall fully and carefully instruct the Owner, or Owner's selected representatives, as to the proper operation, care and maintenance of each system and its equipment.
8. Fire Alarm, Security, Sound, PA, Clock, etc., Systems: The manufacturer shall conduct and record a device by device test. Verify completely proper operation. Record all items checked for each device and device location on a form. Submit this final checkout form to the Engineer.

1.17 TESTING AND ADJUSTMENT:

A. All equipment shall be checked for proper adjustment and balance. All panelboards, distribution panels, switchboards, and transformers shall be balanced to provide a balanced load on each phase. A complete record of all such adjustments shall be made. Final readings shall be submitted to the Architect-Engineer for records. The Contractor shall provide all equipment, instruments, gauges, meters, etc., as required for the complete checking of these systems.

B. Mechanisms of all electrical equipment shall be checked, adjusted, and tested for proper operation. Adjustable parts of all lighting fixtures and other electrical equipment shall be checked, adjusted, and tested as required to produce the intended performance.

C. Completed wiring system shall be free from open or shorted circuits. After completion, this Contractor shall perform tests for insulation resistance in accordance with the requirements of the National Electrical Code.

D. The Contractor shall maintain service and equipment for the testing of electrical equipment and apparatus until all work is approved and accepted by the Owner. A first class voltmeter and ammeter shall be kept available at all times and this Contractor shall provide service for test readings when and as required. All test readings shall be recorded on an approved form and submitted to the Architect.

E. Before final acceptance is made, this Contractor shall, at his own expense, frame under plastic the sequence of operations of the sound system, controls, fire alarm, etc., for each and every item requiring instructions. These instructions shall be mounted as directed. He shall cover same with Engineer and/or his selected parties, and shall adjust all apparatus and place same in satisfactory operating service as approved by the Engineer.

F. Final observation will be made upon written request from the Contractor after the project is complete. At the time of final observation, the Contractor shall be present or shall be represented by a person of authority. The Contractor shall demonstrate, as directed by the Architect-Engineer, that his work fully complies with the purpose and intent of the drawings and specifications. All labor, services, and all instruments or tools necessary for such demonstration and tests shall be provided by the Contractor.

1.18 AS-BUILT DRAWINGS:

A. E.C. shall prepare and submit to the Engineer, upon completion of the project, one complete set of reproducible "As Built" drawings for the electrical portion of the project.

B. Drawings shall clearly indicate any and all approved deviations (i.e. addendum items, change order data, etc.) from the Project Bid Documents.

C. These drawings will become the property of the Owner and will be for his future reference file, record document.

1.19 FINAL OBSERVATION:

A. Final observation will be made upon written request from the General contractor after the project is completed; in accordance with the Supplementary General Conditions.

B. Furnish a workman familiar with this project to accompany the Engineer on final observation and have available ladders, drop cords, and other equipment as required to gain access to any portion of this system.

C. This Contractor and his principal subcontractors shall be represented at the inspection by a person of authority responsible to demonstrate to the engineer that his work conforms to the intent of the plans and specifications.

D. Extra observations made necessary by the Electrical Contractor's failure to comply with the conditions as set forth above shall be charged to the Contractor for the Inspector's time both on the job and spent in travel between the office and the project site.

1.20 GUARANTEE:

A. This Contractor, by the acceptance of this specification and the signing of his contract, acknowledges his acquaintance with the requirements and guarantees that every part used in constructing the system as herein described will be of the best of its respective kind that can be obtained and will be erected in a most thorough and substantial manner by none but experienced workmen.

B. He guarantees that all conduit as provided within and by this specification will be free from all obstructions of every description and will be free from holes or broken places and be well bonded together. He guarantees that all wiring and conduit to be used in construction of this project will be new and unused.

C. He further guarantees to hold himself responsible for any defects which may develop in any part of the entire system, including apparatus and appliances provided under this section of the specification, and to replace and make good without cost to the Owner any such faulty parts of construction which develop defects at any time within one year from date of final certification of completion and acceptance. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to the Owner's satisfaction, advise Architect in writing, describe efforts to rectify situation, and provide analysis of cause of problem. Architect will then suggest course of action. The Electrical Contractor shall replace material and equipment that requires excessive service during guarantee period as defined and as directed by the Architect. This guarantee does not include ordinary lamp failure.

D. Use of systems provided under the Specification for temporary services and facilities shall not constitute Final Acceptance of the work nor beneficial use by the Owner, and shall not institute guarantee period.

1.21 SINGULAR NUMBER:

A. Where any device or part of equipment is referred to in these specifications or on the drawings in the singular number (such as "the switch"), such reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

1.22 PERFORMANCE:

A. Provide as part of the work of this contract, in addition to the first year guarantee on equipment and materials, the following described routine maintenance and inspection. (The one year time period will not start until each and every item is complete in accordance with drawings and specifications and accepted by the

Owner). Check all emergency systems, control, fire alarm, transformers, etc., correct and adjust same. This service to be provided during the guarantee period.

1.23 SYSTEM:

A. System: Distribution characteristics shall be as indicated on drawings.

1.24 SUPPLEMENTARY CONDITIONS:

A. Supplementary to all other terms of the contract, this work shall be performed subject to the following conditions.

B. Materials and equipment installed on this project shall be first class in quality and shall be new and unused.

C. Workmanship on this project shall be first class work performed by the experienced licensed mechanics of the proper trade.

D. Work under this contract shall be adequately protected at all times. Storage, parking, signs, advertisement, fires and smoking shall conform to all applicable regulations and/or directions of the Architect.

E. Measurements on job and shop layouts required for installation of work shall be the responsibility of the contractor and acceptance of work is subject to approval of shop drawings by the Architect.

F. Contractor shall furnish all hoists, scaffolds, staging, runways and equipment necessary for the completion of this work.

G. Obtain and pay for all required electrical permits and licenses.

H. Maintain lights and guards required for safety.

I. Remove temporary service after use.

1.25 CONTRACT CHANGES:

A. All changes or deviations from the contract, including those for extra or additional work, must be submitted in writing for the approval of the Architect/Engineer. No verbal orders will be recognized.

1.26 RUBBISH/CLEANUP:

A. All rubbish resulting from the work herein specified shall be periodically removed by this Contractor.

B. Clean all electrical equipment and materials of all foreign matter (both inside and out). Clean all light fixtures using only methods and materials as recommended by the manufacturer.

1.27 PROPOSALS:

A. The Contractor shall consult the General Conditions and the Proposal Form for proposals and subdivisions of the work required.

1.28 EXTENT OF WORK:

A. The extent of the work under this heading of the contract shall be the furnishing of all plant, labor, materials, and equipment as required to complete work as shown on the drawings and as specified under this heading, and all plant, labor, materials and equipment not shown on the drawings or specified, but necessary to make installation complete in accordance with the intent of the contract, to provide first class, complete, and operative installation throughout.

1.29 TAXES:

A. Contractor shall include all applicable local, state and federal taxes in his bid. Consult the Supplementary Conditions of these specifications relative to any and all tax exemptions permitted for this project.

END OF SECTION 260500

# SECTION 260519 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

## PART 1 - GENERAL

### 1.1 DESCRIPTION:

A. This section includes the furnishing, installation, and connection of the power, lighting, system, and control wiring.

## PART 2 - PRODUCTS

### 2.1 CABLE AND WIRE (POWER AND LIGHTING):

A. Cable and Wire: Fed. Spec. J-C-30, except as hereinafter specified. All conductors shown on plans are sized for copper. UL label required. American, Southwire, Essex, or equal, rated 600 volts, finished with fadeless color coding and bearing Underwriters label.

All cable and wiring shall be continuous between electrical equipment. Splices shall not be added except as required for taps in branch circuits or as approved by the engineer. No splices will be allowed within panelboards and switchboards.

B. Single Conductor:
1. Soft annealed copper.
2. All conductors #8 gauge and larger shall be stranded unless noted otherwise All conductors #10 gauge and smaller may be solid or stranded unless noted otherwise on the drawings. Stranded conductors may be used only on devices and lugs that are U.L. listed for use with stranded conductors.
3. Minimum size No. 12, except where larger sizes are shown. (Size No. 14 minimum for controls).

C. Insulation:
1. Wires for general use within the building shall be type THHN or type THWN, 90 degree rated except where called for otherwise on the drawings. Type THHN or type THWN shall be used at the temperature rating of equipment termination lugs, environmental conditions, and as Code allows. Wires for other than general use shall be as hereinafter specified for specific services.

D. Multiconductor Cables:
1. Comply with NEMA WC 70; Exterior sheath shall be color coded to distinguish between cable voltages and quantity of phase conductors.
2. Type AC Cable, Armored cable, shall comply with UL 1479 and UL 4 with green grounding conductors in addition to Armor/Bond wire ground combination. Cables shall be listed for use in environmental air space in accordance with NFPA 70 Article 300.
3. Type MC Cable, Metal-clad cable; shall comply with UL 1479 and UL 1569 with green grounding conductors. Cables shall be listed for use in environmental air space in accordance with NFPA 70 article 300.

4. Type HCF(Health Care Facility)-MC Cable, Metal-clad cable; shall comply with UL
83, 1569, and UL 1063 with green grounding conductors. And green aluminum interlocked armor. Cables shall be listed for use in environmental air space in accordance with NFPA 70 article 300.

E. An equipment grounding conductor, sized per NEC Article “Grounding”, shall be installed in each conduit containing phase conductors.

F. Color Code:
1. All conductors shall be identified by circuit number and color coding at all termination points and splices. All conductors shall be identified in all pull and junction boxes by the following method of color coding. Means of identification shall be permanently posted at each branch circuit panel with a nameplate identifying color coding system used in that panelboard.

| Phase | 208/120V | 480/277V | 240V. | 240/120V |
|---|---|---|---|---|
| A | Black | Brown | Black | Black |
| B | Red | Orange | Red | Red |
| C | Blue | Yellow | Blue** | |
| Neutral | White | Gray* | | White |
| Ground | Green | Green | Green | Green |
| Iso. Grd | Green w/Yellow | Green w/Yellow | Green w/Yellow | Green w/Yellow |

* or white with colored (other than green) tracer.
**Identify ‘High Leg’ per N.E.C.

2. Use solid color compound or solid color coating for No. 6 and smaller branch circuit conductors and neutral sizes.
3. Phase conductors No. 4 and larger color code using one of the following:
   a. Solid color compound or solid color coating.
   b. Colored as specified using 3/4-inch wide tape. Apply tape in two layers, half overlapping turns for a minimum of three-inches for terminal points, and in junction boxes, pull boxes, troughs, manholes, and handholes. Apply the last two laps of tape with no tension to prevent possible unwinding. Where cable markings are covered by tape, apply tags to cable stating size and insulation type. Where any conductor is or can be supplied from an emergency system, the Contractor shall mark each conductor with an additional two layers, one-half lapped, of purple colored vinyl electrical tape.
   c. Yellow stripe on isolated ground may be 1/4-inch wide yellow tape on top of green.
4. For modifications and additions to existing wiring systems, color coding shall conform to the existing wiring system.
5. Provide plastic engraved color code legend on each panelboard and switchboard per NEC Article “Branch Circuits”, “Identification Of Ungrounded Conductors”.
6. All improperly color coded conductors will be completely replaced at no additional cost to Owner.

G. See riser diagrams and/or other sections of the Specifications for types and ratings for sound, fire alarm, control and other special cables.

H. Where quantities of conductors in a raceway system are not specifically indicated, provide the number as required to maintain function, control and number of circuits as indicated.

I. All isolated ground circuits shall be provided with separate phase, neutral, and ground conductors (no shared neutrals or grounds). All isolated ground circuits shall be installed in separate raceways from all other circuiting.

J. Where multiple sets of conductors are indicated, do not install the same phase conductors in the same raceway. Each raceway shall be provided with A, B, C phase conductors, neutral (if indicated), and ground (if indicated).

K. Where GFCI circuit breakers are used, provide a separate neutral conductor for the GFCI circuit. (Not a shared neutral with another circuit).

2.2 SPLICES AND JOINTS:

A. In accordance with UL 486 A, B, D and NEC.

B. Splices and taps for #6 and larger conductors shall be made with block type terminations (with insulating jacket) or with split bolt connectors, covered and completely insulated with a minimum of three half-lapped layers of Scotch No. 33+ (105 degree C) plastic electrical tape or by approved insulated fastener. All splices and taps having irregular surfaces shall be properly padded with Scotchfil putty before application of insulating plastic tape. Scotchlok electrical pre-insulated spring pressure connectors or equal may be used for up to #8 conductors.

2.3 CONTROL WIRING:

A. All control wiring shall be copper, solid or stranded, #14 Ga. or larger depending upon current requirements, with insulation type for 90 C. rating. Where stranded conductors are used, provide with spade type insulated copper terminals. Unless noted otherwise on the Mechanical drawings or herein, all mechanical control wiring for all systems shall be routed within conduit, shall be of the same insulation type and shall be continuous between outlets and boxes (with no splices or taps into conduit). All line and low voltage mechanical control wiring, conduit, connections, and/or terminations are by the Electrical Contractor unless specifically noted otherwise within the bidding documents.

2.4 WIRE LUBRICATING COMPOUND:

A. The cable pulling lubricant shall be compatible with all cable jackets. The lubricant shall be UL (or CSA) listed. The lubricant shall contain no waxes, greases, silicones, or polyalkylene glycol oils or waxes.

B. A 200-gram sample of the lubricant, when placed in a one-foot, split metal conduit and fully dried for 24 hours at 105 degrees C, shall not spread a flame more than three-inches beyond a point of ignition at a continued heat flux of 40 $kW/m^2$. Total time of test shall be one-half hour.

C. Approved Lubricant is:

1. Dyna Blue
2. Polywater J available from:
3. American Polywater Corporation
4. Equal by Quick Slip from Buchanan
   CCR Wire Pulling Lube from CRC
   Poly-X from American Colloid.

2.5 FIREPROOFING TAPE:

A. The tape shall consist of a flexible, conformable fabric of organic composition coated one side with flame-retardant elastomer.

B. The tape shall be self-extinguishing and shall not support combustion. It shall be arcproof and fireproof.

C. The tape shall not deteriorate when subjected to water, gases, salt water, sewage, or fungus and be resistant to sunlight and ultraviolet light.

D. The finished application shall withstand a 200 ampere arc for not less than 30 seconds.

E. Securing tape: Glass cloth electrical tape not less than 7 mils thick, and 3/4-inch wide.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERALLY:

A. Install in accordance with the NEC, and as specified.

B. Unless noted otherwise on the Electrical drawings or herein, all feeders and circuits for all systems shall be routed within conduit, shall be of the same insulation type and shall be continuous between outlets and boxes (with no splices or taps into conduit).

C. Branch circuits concealed in ceilings, walls and partitions: Single conductors in raceways. Type AC and Type MC in locations limited to the following:

1. Type AC and Type MC are acceptable for the following applications:
   a. Install cables for lighting fixtures whips and for branch circuits concealed in walls and partitions only. Locate junction box and convert to single conductors in rigid raceway within 24-inches from the point the cable exits the wall. Do no install cable in the web of metal studs.
      1) Use only single-circuit cable (i.e. two wire plus ground). For devices in the same wall connected to different circuits, install separate single circuit cable for each circuit.
2. Type AC and Type MC are not acceptable for the following applications; instead provide single conducts in rigid raceway:

a. Homeruns to panelboards.
b. Branch circuits and feeders serving HVAC equipment, elevator equipment, and kitchen loads.
c. Within mechanical, electrical or communication rooms.
d. Exposed branch circuits within areas that do not have ceilings (i.e. exposed to structure) or rooms with cloud ceilings that have exposed structure around the perimeter of the room.

D. Splices and taps in outlet boxes shall be twisted joints. U.L. approved pre-insulated spring pressure connectors shall be used for branch circuit connections. Connectors shall be installed so that all conductors are properly insulated.

E. Splice cables and wires only in outlet boxes, junction boxes, pull boxes, manholes, or handholes. Do not splice cables in panelboards, switchboards, disconnects, etc.

F. Install cable supports for all vertical feeders in accordance with the NEC. Provide split wedge type which firmly clamps each individual cable and tightens due to cable weight.

G. For panelboards, cabinets, wireways, switches, and equipment assemblies, neatly form, and tie all cables.

H. All exposed conduit located in architecturally finished areas shall be painted to match finish color selected by architect.

I. Seal cable and wire entering a building from underground between the wire and conduit, where the cable exits the conduit, with a non-hardening approved compound.

J. Wire Pulling:
1. Provide installation equipment that will prevent the cutting or abrasion of insulation during pulling of cables.
2. Use ropes made of nonmetallic material for pulling feeders.
3. Attach pulling lines for feeders by means of either woven basket grips or pulling eyes attached directly to the conductors, as approved by the Engineer.
4. Pull multiple cables into a single conduit with a single continuous pull.
5. Always use wire lubricant per this specification.

K. Elevators
1. If an elevator is provided with a battery lowering device, the contractor shall be responsible for providing the low voltage wiring between the battery lowering device and the auxiliary contact located in the elevator power module or local disconnecting device. Provide an auxiliary contact located in the elevator power module or local disconnecting device if not already specified. Coordinate all requirements with the equipment manufacturer prior to bid.

3.2 SPLICE INSTALLATION:

A. Splices and terminations shall be mechanically and electrically secure.

B. Where the Engineer determines that unsatisfactory splices or terminations have been installed, remove the devices and install approved devices at no additional cost to the Owner.

3.3 CONTROL, COMMUNICATION, AND SIGNAL WIRING INSTALLATION:

A. Unless otherwise specified in other sections of these specifications, install wiring as described below. Wiring shall be connected to perform the functions shown and specified in other sections of this specification.

B. Except where otherwise required, install a separate power supply circuit for each system, or control equipment, or control power. Circuit to nearest 120 volt panel or nearest emergency panel if equipment controlled is connected to emergency system. Provide 20 Amp breakers in panels where none are designated. Verify all requirements with actual equipment supplied in field.

C. Install a breaker lock-on clip on the handle of the branch circuit breaker for the power supply circuit for each system to prevent accidental de-energizing of the systems.

D. System voltages shall not exceed 120 volts and shall be lower voltages where shown on the drawings or required by the NEC.

E. Wire and cable identification:
1. Install a permanent wire marker on each wire at each termination, outlet box, junction box, panel, and device.
2. Identifying numbers and letters on the wire markers shall correspond to those on the wiring diagrams used for installing the systems.
3. Wire markers shall retain their markings after cleaning.

3.4 FIELD TESTING:

A. Feeders and branch circuits shall have their insulation tested after installation and before connection to utilization devices such as fixtures, motors, or appliances.

B. Test shall be performed by meggar and conductors shall test free from short-circuits and grounds.

C. Test conductors phase-to-phase and phase-to-ground.

D. Meggar motors after installation but before start-up and test free from grounds.

E. The Contractor shall furnish the instruments, materials, and labor for these tests.

END OF SECTION 260519

# SECTION 260526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

### 1.1 DESCRIPTION:

A. This section specifies general grounding and bonding requirements of electrical installations.

## PART 2 - PRODUCTS

### 2.1 GROUNDING CONDUCTORS:

A. General Purpose: UL and NEC approved types, copper, with THHN or type THWN, or dual rated THHN-THWN insulation color identified green, 90 degree rated.

B. Size conductors not less than what is shown and not less than required by the NEC.

### 2.2 GROUND RODS:

A. Copper clad steel, 3/4-inch diameter by 10 feet long.

### 2.3 SPLICES:

A. All splices and grounding electrode connections shall be made with exothermic welds.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERALLY:

A. Ground in accordance with the NEC as shown, and as hereinafter specified. All equipment ground conductors shall be terminated on a ground bus or ground lug attached to equipment can.

B. System Grounding:
   1. Secondary service neutrals shall be grounded at the supply side of the secondary disconnecting means and at the related transformers.
   2. Separately derived systems (transformers downstream from the service entrance) ground the secondary neutral.
   3. Individual Buildings: Bond Main Disconnect ground bus to water pipe, and driven ground. Provide bond to 20 foot re-bar in foundation or to building steel, if indicated on the drawings or required by local Codes.

C. Equipment Grounding:
1. Metallic structures, enclosures, raceways, junction boxes, outset boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits shall be grounded for personnel safety and to provide a low impedance path for possible ground fault currents.

3.2 SECONDARY EQUIPMENT AND CIRCUITS:

A. Main Bonding Jumper: Connect the secondary service neutral to the ground bus in the service equipment.

B. Water Pipe and Supplemental Electrode:
1. Provide a ground conductor connection between the service equipment ground bus and the metallic water pipe system. Jumper insulating joints in the water pipe.
2. Provide a supplemental grounding electrode and bond to the water pipe ground, or connect to the service equipment ground bar.

C. Service Disconnect: Provide a ground bar bolted to the enclosure with lugs for connecting the various grounding conductors. Connect the neutral to the ground bus (main bonding jumper).

D. Switchgear, Switchboards:
1. Connect the various feeder green grounding conductors to the ground bus in the enclosure with suitable pressure connectors.
2. Connect the grounding electrode conductor to the ground bus.
3. Connect metallic conduits, which terminate without mechanical connection to the housing, by grounding bushings and ground conductor to the ground bus.

E. Transformers:
1. Exterior: Exterior transformers supplying interior service equipment shall also have the neutral grounded at the transformer secondary. Provide a grounding electrode at the transformer.
2. Separately derived systems (transformers downstream from service equipment): Ground the secondary neutral at the transformer. Provide a grounding electrode conductor from the transformer to the nearest cold water pipe.

F. Raceway Systems:
1. Ground all metallic raceway systems.
2. Raceway provided for mechanical protection containing only a grounding conductor, bond to that conductor at the entrance and exit from the raceway.

G. Feeders and Branch Circuits: Install green grounding conductors with feeders and branch circuits in all feeders and branch circuits and in any raceway containing a phase conductor.

H. Isolated Grounds: All isolated grounds must be insulated and must terminate on isolated ground buses in the equipment. No other equipment grounds shall be connected to isolated ground bus. Where isolated grounds are shown and PVC conduit is used, an equipment ground must be installed to ground metallic boxes

and mounting straps. Provide separate isolated ground for each circuit. (No shared ground conductors for isolated circuits).

I. Boxes, Cabinets, Enclosures, and Panelboards:
   1. Bond the grounding conductors to each pullbox, junction box, outlet box, cabinets, and other enclosures through which the ground conductors pass (except for special grounding systems for intensive care units and other critical units shown.).
   2. Make ground conductor connections to ground bus in motor control centers, panelboards, etc.

J. Receptacles and toggle switches are not approved for grounding through their mounting screws. Ground devices from the grounding conductor of the wiring system to the green ground terminal on the device.

K. Ground lighting fixtures to the green grounding conductor of the wiring system.

L. Fixed electrical appliances and equipment shall have a ground lug installed for termination of the green ground conductor.

M. Telephone Terminal Boards: Provide a #6 cu. ground in 3/4" c. from each board to the main service disconnect ground bus.

3.3 CONDUCTIVE PIPING:

A. Bond all conductive piping systems in the building to the electrical system ground. Bonding connections shall be made as close as practical to the water pipe ground or service equipment ground bus.

3.4 GROUNDING RESISTANCE:

A. Grounding system ground resistance must not exceed 5 ohms. Final tests shall assure that this requirement is met. Submit to the Engineer.

B. Where permanent ground connections are required, make the connections by the exothermic process to form solid metal joints.

C. Where rock prevents the driving of vertical ground rods, install grounding electrodes in horizontal trenches to achieve the specified resistance.

D. Where more than one ground rod is required to meet the specified resistance, they shall be located at least 10 feet apart.

END OF SECTION 260526

# SECTION 260533 – RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

### 1.1 DESCRIPTION:

A. This section includes the furnishing, installation, and connection of raceways, fittings, and boxes to form complete, coordinated, grounded raceway systems. Raceways are required for all wiring unless shown or specified otherwise.

B. Definitions: The terms ‘conduit’ or ‘raceway’, as used in this specification or on the drawings, shall mean any or all of the raceway types specified. The term ‘surface metal raceway’, as used in this specification or on the drawings, shall refer to raceway types specified in 2.1-K.

## PART 2 - PRODUCTS

### 2.1 MATERIAL:

A. Raceway Size: In accordance with the NEC but not less than 1/2-inch unless otherwise noted in other sections of the Specifications.

B. Raceways: Install raceway types as shown on drawings and as listed below. No other raceway systems other than listed below will be allowed. All conduit sizes listed on the drawings are based on conductor fill in EMT conduit. If other conduit types are used, adjust conduit sizes to conform with NEC Chapter 9, Table 4.

1. Rigid steel: UL 6. Rigid intermediate steel conduit (IMC): UL 1242. Rigid conduit (GRC) and intermediate metal conduits (IMC) shall be standard size, hot dip galvanized steel conduit, minimum 1/2" trade size, as manufactured by Wheatland Tube, Triangle PWC, Inc., Allied, or equal. Rigid conduit and IMC shall be provided with threaded fittings and couplings. In trade sizes 2-1/2" to 4", contractor may use Allied 'KwikCouple' fittings in lieu of individual steel couplings. Where 'Kwik-Couple' fittings are used exterior for vertical risers, install fitting with taper end up. A "green" ground wire, sized per NEC 250-122, shall be installed in all conduits containing phase conductors. All conduit exposed exterior of building, in wet locations or subject to physical abuse shall be Rigid Steel or IMC.
2. Electrical Metallic Tubing (EMT): U.L. 797. EMT (thinwall conduit) shall be minimum 1/2" trade size, as manufactured by Wheatland Tube, Triangle PWC, Inc., Allied, or equal. Provide EMT with Thomas and Betts, or equal, U.L. listed steel or die-cast type fittings. Indenter type fittings shall not be used. Contractor may use Allied 'Kwik-Fit' fittings in lieu of individual fittings. A "green" ground wire, sized per NEC 250-122, shall be installed in all conduits containing phase conductors. EMT conduit shall not be installed in earth, in wet locations, exposed exterior to the building, subject to physical abuse, or below grade.
3. Flexible steel conduit: Fed. Spec. WW-C-566 and UL 1. Short runs (6' or less) of galvanized steel or liquid tight steel flexible conduit (flexible steel

tubing covered with extruded liquid-tight jacket of polyvinyl chloride) may be used when approved by the Engineer. (Minimum 1/2" trade size.) A separate "green" ground conductor (sized per N.E.C.) shall be installed in all flexible conduits. Type AC "Armored Cable", Type MC "Metal-clad Cable", or "BX" cable shall not be used in any manor unless supplied as part of a manufactured flexible wiring system for lighting and approved by the Engineer in writing.

4. U.L. approved schedule 40 P.V.C. conduit may only be used where conduits are to be run in earth or below slabs. PVC conduits shall not be used in patient care areas (other than patient sleeping areas) above or below grade. (NEC Article 517.13 (A), 517.10 (B) (2)). These locations shall have branch circuit wiring installed in a metal raceway system, or a cable having a metallic armor or sheath assembly. P.V.C. conduits shall not be used above grade inside or outside of the building, unless specifically noted otherwise on the drawings. Use G.R.S. ells and risers, both horizontal and vertical, unless specifically noted otherwise on the drawings. Use conduit adapters when converting from P.V.C. to steel conduit. Branch circuit and feeder P.V.C. conduit to be 3/4" min. Concrete encase all conduit installed below grade where so noted on the drawings, (U.L. approved schedule 40 P.V.C. with plastic spacers). All P.V.C. conduit shall be provided with a separate "green" ground conductor, sized per N.E.C.

C. Conduit Fittings:
   1. Rigid steel and IMC conduit fittings:
      a. Standard threaded couplings, locknuts, bushings, and elbows: Fed. Spec. W-F-408, except only material of steel or malleable iron are acceptable. Integral retractable type IMC couplings are acceptable also.
      b. Locknuts: Bonding type with sharp edges for digging into the metal wall of an enclosure.
      c. Bushings: Metallic insulating type, consisting of an insulating insert molded or locked into the metallic body of the fitting. Bushings made entirely of metal or nonmetallic material are not permitted. Bushings for conduit smaller than 1-1/4-inch shall have flared bottom with ribbed sides.
      d. Erickson (union-type) and set screw type couplings: Approved for use in concrete are permitted for use to complete a conduit run where conduit is installed in concrete. Use set screws of case hardened steel with hex head and cup point to firmly seat in conduit wall for positive ground. Tightening of set screws with pliers is prohibited.
      e. Sealing fittings: Threaded cast iron type. Use continuous drain type sealing fittings to prevent passage of water vapor. In concealed work, install fittings in flush steel boxes with blank cover plates having the same finishes as that of other electrical plates in the room.
      f. In trade sizes 2-1/2 inches to 4-inches for rigid steel raceway or intermediate metal raceway, contractor may use Allied 'Kwik-Couple' fittings in lieu of individual steel couplings. 'Kwik-Couple' fittings shall not be used in hazardous locations. Where 'Kwik-Couple' fittings are used exterior for vertical risers, install fitting with taper end up.
      g. Where conduits enter boxes, they shall be rigidly clamped to the box by double locknuts and bushings. Conduit shall enter the box squarely. Bushings and locknuts shall be made of malleable iron and shall have sharp clean-cut threads.

2. Electrical metallic tubing fittings:
   a. Fed. Spec. W-F-408, except only material of steel for compression type. Steel or die-cast is acceptable for set screw type. Die-cast compression is not acceptable.
   b. Couplings and connectors: Suitable for the installation. Use gland and ring compression type or set screw type couplings and connectors. Use concrete tight where installed in concrete. Set screw type couplings for conduit 2 inches and larger shall have four set screws each. Use set screws of case-hardened steel with hex head and cup point to firmly seat in wall of conduit for positive grounding.
   c. Indenter type connectors or couplings are prohibited.
3. Flexible steel conduit fittings:
   a. Fed. Spec. W-F-406 and UL 5, except only steel or malleable iron material is acceptable.
   b. Clamp type, with insulated throat.
4. Liquid-tight flexible metal conduit fittings:
   a. Fed. Spec. W-F-406, except only steel or malleable iron material is acceptable.
   b. Type incorporating a threaded grounding cone, a steel or plastic compression ring, and a gland for tightening. Connectors shall have insulated throats.
5. Expansion and deflection couplings:
   a. UL 467 and UL 514.
   b. Accommodate, 1.9 cm (0.75”) deflection, expansion, or contraction in any direction, and allow 30 degree angular deflections.
   c. Include internal flexible metal braid sized to guarantee conduit ground continuity and fault currents in accordance with UL 467, and the NEC code tables for ground conductors.
   d. Shall be watertight, seismically qualified, corrosion-resistant, threaded for and compatible with rigid or intermediate metal conduit.
   e. Jacket: Flexible, corrosion-resistant, watertight, moisture and heat resistant molded rubber material with stainless steel jacket clamps.

D. Raceway Supports:
1. Parts and hardware: Zinc-coat or provide equivalent corrosion protection.
2. Pipe Straps: Fed. Spec. FF-S-760, Type I, Style A or B.
3. Individual Raceway Hangers: Designed for the purpose, having a pre-assembled closure bolt and nut, and provisions for receiving a hanger rod.
4. Multiple Raceway (trapeze) hangers: Not less than 1-1/2 by 1-1/2 inch, 12 gauge steel, cold formed, lipped channels; with not less than 3/8-inch diameter steel hanger rods.
5. Solid Masonry and Concrete Anchors: Fed. Spec. FF-S-325; Group III self-drilling expansion shields, or machine bolt expansion anchors Group II, Type 2 or 4, or Group VIII.

E. Outlet Boxes:
1. UL-50, UL514A, Fed. Spec. W-C-586 and Fed. Spec. W-J-800.
2. Cast metal where required by the NEC or shown, and equipped with rustproof boxes.
3. Sheet metal boxes: 4-inch square, galvanized steel, except where otherwise shown. Single gang ‘Handy Boxes’ will not be allowed.

4. Boxes installed in concrete or masonry and boxes larger than two gang shall be masonry type.

F. Wireways: Equip with hinged covers, except where removable covers are shown. All exterior wireways NEMA 3R. Size all wireways per National Electrical Code.

G. Pull and Junction Boxes:
1. Pull and junction boxes shall be code gauge steel boxes with hinged, bolted or screwed covers. Boxes shall be flush or surface mounted as shown or required by N.E.C and job conditions.
2. Junction and pull box shall be installed where shown on drawings and additional boxes shall be installed if required for pulling of wire provided location and installation is approved by the Architect. All boxes shall be code construction and size with screw type cover and shall be installed in accessible locations.
3. Conductors shall not be spliced within pull boxes.
4. Boxes shall be rated as shown on the drawings or as required by applicable codes, ie: raintight, weatherproof, explosionproof, etc.

H. Floor Boxes:
1. Verify exact location of all floor boxes with the architect prior to rough-in. All floor boxes shall conform to UL 514A and UL 514C scrub-water testing standards. Unless otherwise specified on the drawings or in the special outlet schedule, floor boxes shall be as follows, or equal by Walker/Wiremold:
   a. Fully adjustable, stamped steel, concrete tight with knockouts on bottom and all four sides (1/2", 3/4" and 1" sizes) shall be Steel City #68-D or Hubbell #B-2527 deep when concrete floor thickness above any part of deck is 4-inch thick or more; and Steel City #68-S or Hubbell #2529 shallow when concrete floor thickness is 3-inch up to 4-inch.
   b. Cover plates shall be polished brass. Steel City #P60-DS or Hubbell #S3925 hinged lift L105 for duplex receptacles, Steel City #P60 or Hubbell #S Series for single receptacles with removable plug sized to match the receptacle to be installed, and Steel City #P60-3/4-2 or Hubbell #S-88-1 for telephone, TV, microphone, and furniture feed floor boxes. Route liqutite conduit from furniture feed floor box to furniture.
   c. Provide polished brass carpet flanges in all carpeted areas: Steel City #P60-CP or Hubbell #S-3082.
   d. PVC floor boxes may be used in lieu of floor boxes indicated above. PVC floor boxes shall be equal to Walker, Wiremold, Hubbell, Carlon, with metal covers. Receptacle covers shall be double flap, telephone and data covers shall be combination 2”/1/2” inserts. Unless noted otherwise on the drawings, all floor boxes for similar devices shall be either metal or PVC, no intermixing of same types of floor boxes will be allowed.
2. Multi-gang floor boxes shall be fully adjustable, cast iron, watertight use deep type in floors 4-inch or thicker and use shallow type in floors 2 1/2-inch to 4-inch thick. All multi-gang floor boxes shall conform to UL 514A and UL 514C scrub-water testing standards. Provide barriers between line and low voltage compartments of multi-gang floor boxes.

   Multi-gang floor boxes: (or equal by Walker/Wiremold)

| STEEL CITY | Single | Double | Triple |
|---|---|---|---|
| | | | |
| Deep Floor Box | 641 | 642 | 643 |
| Shallow Floor Box | 841 SC | 842 SC | 843 SC |
| Carpet Flange | P64-CP | P64-2G-CP | P64-3G-CP |
| | | | |
| HUBBELL | Single | Double | Triple |
| | | | |
| Deep Floor Box | B-2436 | B-4233 | B-4333 |
| Shallow Floor Box | B-2414 | B-4214 | B-4314 |
| Carpet Flange | SB-3083 | SB-3084 | SB-3085 |

Cover plates shall be polished brass Steel City #P64-DS or Hubbell #S3825 for duplex receptacles, Steel City #P64 or Hubbell #S Series for single receptacles with removable plug sized to match the receptacle to be installed; and Steel City #P64-3/4-2 or Hubbell S-2425 for telephone, TV, microphone, and other systems floor boxes.

I. Poke Through Outlets: Verify exact location with Architect prior to rough in. Poke through outlets shall be UL Listed for 2 hour fire rating. All poke-through outlets shall conform to UL 514A and UL 514C scrub-water testing standards.
   1. Flush Type: Provide with 20A., 120 volt duplex receptacle or 20A. 120 volt duplex isolated ground receptacle as shown on the drawings, per the specification. Walker RC3A20BS Series, or equal by Hubbell. Verify flange and slide color with Architect.
   2. Flush furniture feed: Walker RC7006ABR Series, or equal by Hubbell, with liquitite conduit connection to furniture. Verify flange and conduit adaptor assembly color with Architect.

J. Concealed Service Floor Box: Verify exact location with architect prior to rough-in. All concealed service floor boxes shall conform to UL 514A and UL 514C scrub-water testing standards.
   1. Multiple service type with no exposed service fittings. Provide with receptacle, telephone, and data outlets as shown in the Special Outlet Schedule. Verify color with the Architect. Unless otherwise noted in the Special Outlet Schedule, provide Walker RFB4 Series with receptacle, data, and telephone brackets as required and S36CCTC Series recessed activation cover, or equal by Hubbell or Steel City.

K. Surface Metallic Raceway:
   1. Only metallic surface raceways shall be used unless specifically noted otherwise on the Drawings.
   2. Surface metallic raceway and associated outlet boxes shall only be used where shown on the drawings and in remodels and modifications to existing where existing wall and ceiling voids do not permit concealed installation, but shall not be used at any other location unless shown otherwise on the drawings. All outlet box and surface metallic raceway locations must first be approved and coordinated with the Architect. All surface raceway and outlets must be painted to match the surface it is attached to. Use outlet boxes and fittings by the same manufacturer and approved for use with the raceway.

Install an equipment grounding conductor sized per NEC Article “Grounding” for the largest circuit in the raceway if not already specified.

3. Raceways shall be Wiremold #V500 minimum or #V700 for small sizes and Wiremold Series 2000, 3000, and 4000 for larger capacities, unless noted otherwise on the drawings. In all cases, do not exceed the fill per the manufacturers published data. Surface metallic raceways shall be sized to match the conduit sizes indicated on the drawings, or as required by Code. For telephone, data, video, or CATV outlet boxes, use Wiremold V700 series minimum.
4. Surface metallic raceways shall be provided with all mounting hardware, covers, fittings, outlet boxes, elbows, tees, etc. as required for a complete system.

## PART 3 - EXECUTION

### 3.1 RACEWAY:

A. An equipment grounding conductor, sized per NEC Article “Grounding”, shall be installed in all conduits containing phase conductor(s).

B. Rigid galvanized steel (GRC) or IMC must be used at all times when exposed to weather or physical abuse and in all NEC classified hazardous locations. EMT may not be used in direct contact with earth, or in concrete slabs on grade.

C. U.L. approved Schedule 40 P.V.C. conduit may be used where feeders or branch circuits are to be run in earth or slabs (3/4" minimum), except as noted otherwise in 2.1-B-4. Use GRC ells and riser, both horizontal and vertical. All conduit risers through concrete floors shall be GRC from below the top of the floor slab. Use conduit adapters when converting from P.V.C. to steel conduit. Use plastic spacers when more than one conduit is installed together. Spacers shall be installed per NEC Article “Rigid Nonmetallic Conduit”. See Drawings for areas requiring concrete encasement. All P.V.C. conduits shall be provided with separate ground conductor sized per N.E.C.

### 3.2 PENETRATIONS:

A. Cutting or Holes:
1. Locate holes in advance where they are proposed in the structural sections such as ribs or beams. Obtain the approval of the Structural Engineer prior to drilling through structural sections.
2. Cut holes through concrete and masonry in new and existing structures with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills are not allowed, except where permitted by the Structural Engineer as required by limited working space.
3. All patching shall be done in a neat and workman-like manner, meeting with the approval of the Architect, by mechanics of the particular trade involved.

B. Fire Stop:
1. Where conduits, wireways, and other electrical raceways pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that

provides an effective barrier against the spread of fire, smoke and gases, and maintains specified fire rating. Completely fill and seal clearances between raceways and openings with the fire stop material.

C. Fire Barrier Penetration Seals:
1. Manufacturer: Subject to compliance with requirements, provide fire barrier penetration seals of one of the following:
a. 3M fire Barrier Caulk, Putty, or Strip Sheet
b. Carborundum Fiberfrax Fyre Putty
c. Tremco X-ferno Fire Products
d. Rectorseal Metacalk
2. Provide seals for any opening through fire-rated walls, floors or ceilings used as passage for components such as conduits or cables.
3. Cracks, voids or holes up to 4-inch diameter: Use putty or caulking, one-piece intumescent elastomer, non-corrosive to metal, compatible with synthetic cable jackets, and capable of expanding 10 times when exposed to flame or heat and UL-listed.
4. Openings greater than 4-inch diameter and raceway sleeves through floors at telephone terminal boards: Use sealing system capable of passing 3-hour fire test in accordance with ASTM E-814, consisting of wall wrap or liner, partitions, and end caps capable of expanding when exposed to temperatures of 250 degrees to 350 degrees F (121 to 177·C), that is UL-listed. KBS "Sealbags" manufactured by P-W Industries will be acceptable.
5. Execution: Fill entire opening with sealing compound. Adhere to manufacturer's installation instructions. All fire barrier seals shall meet the rating of the wall.

D. Waterproofing:
1. At floor, exterior wall, and roof conduit penetrations, completely seal clearances around the conduit and make watertight.
2. Any penetrations through roof shall be made with “Stoneman” flashing connections as manufactured by Stoneman Engineering and Manufacturing Co., Inglewood, California, and any penetrations made in exterior or basement foundation walls shall be sealed with Thunderline “Link-seal” connections, as manufactured by Thunderline Corporation, Wayne, Michigan.

3.3 CONDUIT SYSTEMS INSTALLATION, GENERAL:

A. Installation: In accordance with UL, NEC, as shown, and as hereinafter specified.

B. Essential (Emergency) raceway systems: Install entirely independent of other raceway systems. Common supports and hangers may be used.

C. Raceway Burial Depths: (Underground work)
1. 30 inch minimum cover to grade or bottom of floor slab.
2. 36 inch minimum cover to grade from top of conduit for secondary services. (Unless otherwise required by Utility Co.) Use minimum 24" radius bends.
3. 4 inch below concrete slab inside a building.
4. 48 inch minimum cover to grade from bottom of conduit for primary services. (Unless otherwise required by Utility Co.) Use minimum 36" radius bends.

D. Install raceways as follows:
1. In complete runs before pulling in cables or wires.
2. Flattened, dented, or deformed raceways is not permitted. Remove and replace the damaged raceways with new undamaged material.
3. Assure raceway installation does not encroach into the ceiling height head room, walkways, or doorways.
4. Cut square with a hacksaw, ream, remove burrs, and draw up tight.
5. Mechanically and electrically continuous.
6. Independently support raceway. Do not use other supports i.e., (suspended ceilings, suspended ceiling supporting members, lighting fixtures, mechanical piping, or mechanical ducts.). Group raceways with common supports where possible. Conduit shall be supported within 12-inches of connectors.
7. Close ends of empty raceway with plugs or caps at the rough-in stage to prevent entry of debris, until wires are pulled in, or at locations where conduits are stubbed out below grade outside of building.
8. Raceway installations under fume and vent hoods are prohibited.
9. Secure raceways to cabinets, junction boxes, pull boxes and outlet boxes with bonding type locknuts. For GRC and IMC raceway installations, provide a locknut on the inside of the enclosure, made up wrench tight. Do not make raceway connections to junction box covers.
10. Raceways shall not be used as a support for other raceways or cables.
11. Where conduit sizes are not specifically indicated, provide sizes in accordance with the requirements of the N.E.C.
12. Conduit to be installed to the requirements of structure and to the requirements of all other work on the project. Conduit shall be installed to clear all openings, depressions, pipes, ducts, reinforcing steel, etc. Conduit set in forms for concrete structure shall be installed in such a manner that installation will not affect the strength of the structure. Coordinate installation with Structural Engineer for conduits rising up from floor slabs into bottom of panelboards. Minimum distance between conduits shall be 6". Maximum size of conduit permitted in concrete slabs, if so approved by the Architect, is 1" trade size.
13. Conduit shall be installed continuous between connections to outlets, boxes and cabinets with a minimum possible number of bends and not more than the equivalent of 4-90 degree bends between J-box connections. Bends shall be smooth and even and shall be made without flattening conduit or flaking enamel. Radius of bends shall be as long as possible and never shorter than the corresponding trade elbow. Long radius elbows shall be used where necessary.
14. Conduits shall be securely fastened in place with approved straps, hangers, and steel supports as required by the National Electrical Code. All surface mounted conduits on walls below eight foot above grade shall be secured with conduit straps, no clamps. The use of wire, plumbers straps, etc, will not be permitted.
15. Junction and pull boxes shall be installed where shown on drawings and additional boxes shall be installed if required for pulling of wire, provided location and installation is approved by the Architect. All boxes shall be code gauge construction with screw type covers and shall be installed in accessible locations.
16. Conduit shall be reamed and thoroughly cleaned before installation and kept clean after installation. Openings shall be plugged and boxes shall be covered as required to keep conduit clean during construction. All conduit shall be fished clear of obstructions before the pulling of wires. All conduit shall be as

sized above and shall not be smaller than N.E.C. listed minimum requirements.

17. All work shall be protected against damage during construction and any work damaged or moved out of line after roughing-in shall be repaired and reset to the approval of the Architect without additional cost to the Owner.
18. Conduit terminations at panelboards, switchboards, motor control equipment, junction boxes, etc., shall be aligned and installed true and plumb. Wood or steel bucks or templates shall be used where required. This work shall also include all steel supports as required for mounting of electrical equipment excepting only where steel supports are specified to be furnished under another specification heading.
19. Where conduits cross construction expansion joints, Contractor shall provide Appleton XJ or equal expansion couplings with copper bonding jumpers.
20. Where conduits are installed in concrete, all connectors and couplings shall be water tight or rated for direct burial in concrete.
21. Mechanical equipment service clearances and electrical apparatus service clearances as specified in their respective manufacturer's product data shall be maintained free from conduit obstructions.
22. Raceways shall not be routed through mechanical ductwork.
23. Route all surface metallic raceways for receptacle, telephone, data and all other wall outlet boxes horizontal at base of wall to nearest corner or door trim before rising vertically up wall. Locate all boxes for devices near doors as near as possible to door trim and rise surface metallic raceway up wall adjacent to door trim. Any surface metal raceways routed down walls into existing floors shall be installed tight to existing walls into the existing floor. If this can not be accomplished because of existing conditions, the surface metal raceways shall be routed to or into the ceiling of the room.

E. Raceway Bends:
1. Make bends with standard raceway bending machines.
2. Raceway hickey may be used for slight offsets, and for straightening stubbed out raceways.
3. Bending of raceways with a pipe tee or vise is prohibited.

## 3.4 CONCEALED WORK INSTALLATION:

A. General:
1. Raceway and Outlet Boxes Installation: All raceway systems work and outlet boxes shall be installed concealed in walls, floor and roof construction or concealed within furred spaces or above ceilings. In equipment or mechanical rooms exposed work shall include feeders and connections to equipment unless noted otherwise.

B. In Concrete:
1. Raceway: GRC, IMC, EMT, or PVC; except do not install EMT in concrete slabs that are in contact with soil, gravel or vapor barriers.
2. Align and run raceways in direct lines (parallel and perpendicular).
3. Install raceways through concrete beams only when the following occurs:
   a. Where shown on the structural drawings.
   b. As approved by the Structural Engineer prior to construction, and after submittal of drawing showing location, size, and position of each penetration.

4. Installation of raceways in concrete that is less than three inches thick is prohibited. All raceways installed in concrete shall be approved by the Structural Engineer.
   a. Raceway outside diameter larger than one-third of the slab thickness is prohibited.
   b. Space between raceways in slabs: Approximately six conduit diameters apart, except one conduit diameter at conduit crossings.
   c. Install raceways approximately in the center of the slab so that there will be a minimum of 3/4-inch of concrete around the raceways.
5. Make couplings and connections watertight. Use thread compounds that are UL approved conductive type to insure low resistance ground continuity through the raceways. Tightening set screws with pliers is prohibited.

C. Above Furred or Suspended Ceilings and in Walls:
1. Raceways for conductors 600 volts and below:
   a. GRC, IMC, or EMT. Types mixed indiscriminately in the same system is prohibited.
2. Raceways for conductors above 600 volts:
   a. GRC.
3. Align and run raceways parallel or perpendicular to the building lines.
4. Connect recessed or lay-in lighting fixtures and all other devices installed in a lay-in ceiling to raceway runs with flexible metal conduit extending from a junction box to the fixture. Provide a ground wire in all flexible conduits.
5. Tightening set screws with pliers is prohibited.

3.5 EXPOSED WORK INSTALLATION:

A. Exposed work only where permitted by the Architect.

B. Raceways for Conductors 600 volts and below:
1. GRC, IMC, or EMT types mixed indiscriminately in the system is prohibited.
2. All raceways exposed to physical abuse and in all industrial pump and treatment plant locations shall be GRC or IMC.
3. All wiring located in the fire pump rooms shall be in IMC conduit.

C. Raceways for conductors above 600 volts:
1. GRC

D. Align and run raceways parallel or perpendicular to the building lines.

E. Install horizontal runs close to the ceiling or beams and secure with raceway straps.

F. Surface metal raceways: Use only where approved and coordinated with Architect.

G. Painting:
1. Paint exposed raceways as specified in Section, PAINTING. All conduit in exposed architecturally areas shall be painted to match finish color selected by architect.

3.6 WET OR DAMP LOCATIONS:

A. Unless otherwise shown, use raceways of GRC or IMC above grade. Use PVC conduit below grade, except rigid galvanized steel ells and risers shall be used.

B. Provide sealing fittings, to prevent passage of water vapor, where raceways pass from warm to cold locations, i.e., (refrigerated spaces, constant temperature rooms, air conditioned spaces) or similar spaces.

3.7 MOTORS AND VIBRATING EQUIPMENT:

A. Use liquid-tight Type UA flexible metal conduit for connections to motors and other electrical equipment subject to movement, vibration, misalignment, cramped quarters, or noise transmission. Provide liquid-tight flexible metal conduit for installation in exterior locations, moisture or humidity laden atmosphere, corrosive atmosphere, water or spray wash-down operations, and locations subject to seepage or dripping of oil, grease or water. Provide a green ground wire with flexible metal conduit.

3.8 RACEWAY SUPPORTS, INSTALLATION:

A. All raceways shall have supports at maximum spacing of 10-feet and within 3-feet of a fitting, elbow, box outlet or enclosure. Safe working load shall not exceed 1/4 of proof test load of fastening devices. This shall apply to both vertical and horizontal conduit runs.

B. Use pipe straps or individual raceway hangers for supporting individual conduits.

C. Support multiple raceway runs with trapeze hangers. Use trapeze hangers that are designed to support a load equal to or greater than the sum of the weights of the raceways, wires, hanger itself, and 200 pounds. Attach each raceway with U-bolts or other approved fasteners.

D. Support raceways independently of junction boxes, pull boxes, fixtures, suspended ceiling T-bars, angle supports, and similar items. Do not support raceways from mechanical piping or ductwork.

E. Fasteners and Supports in Solid Masonry and Concrete:
   1. New Construction: Use steel or malleable iron concrete inserts set in place prior to placing the concrete.
   2. Existing Construction:
      a. Steel expansion anchors not less than 1/4-inch bolt size and not less than 1-1/8 inch embedment.
      b. Power set fasteners not less than 1/4-inch diameter with depth of penetration not less than 3-inches.
      c. Use vibration and shock resistant anchors and fasteners for attaching to concrete ceilings.

F. Hollow Masonry: Toggle bolts are permitted. Bolts supported only by plaster are not acceptable.

G. Metal Structures: Use machine screw fasteners or other devices specifically designed and approved for the application.

H. Attachment by wood plugs, rawl plug, plastic, lead or soft metal anchors, or wood blocking and bolts supported only by plaster is prohibited.

I. Chair, wire, or perforated strap shall not be used to support or fasten conduit.

J. Spring steel type supports "caddy clips" that are listed for the intended use are acceptable in appropriate locations.

K. Vertical Supports: Vertical raceway runs shall have riser clamps and supports in accordance with the NEC and as shown. Provide supports for cable and wire with fittings that include internal wedges and retaining collars.

3.9 BOX INSTALLATION:

A. Boxes for Concealed Raceways:
1. All outlet boxes shall be flush mounted unless noted otherwise on the drawings or herein. Boxes installed in gyp board or plaster finish shall have code gauge galvanized raised covers set to not more than 1/4" behind final finish in non-combustible walls or ceilings, and flush with the wall or ceiling finish in combustible walls or ceilings. Covers shall be selected with proper openings for devices installed in box.
2. Mount flush. Boxes protruding from the finished wall or ceiling surface; recessed with more than 1/4-inch gap between the wall or ceiling surface and the box in non-combustible walls or ceilings; or not flush with the wall or ceiling surface in combustible walls or ceilings will be changed out with all wall or ceiling reconstruction expense paid by the Electrical Contractor.
3. Provide raised covers for boxes to suit the wall or ceiling construction and finish.

B. In addition to boxes shown, install additional boxes where needed to prevent damage to cables and wires during pulling in operations.

C. Remove only knockouts as required and plug unused openings. Use threaded plugs for cast metal boxes and snap-in metal covers for sheet metal boxes.

D. Outlet boxes in the same wall mounted back-to-back are prohibited.

E. Minimum size of outlet boxes for ground fault interrupter (GFI) receptacles is 4-inches square by 2-1/8 inches deep, with device covers for the wall material and thickness involved.

F. Where lighting fixtures and appliance outlets are to be mounted in concrete or in plaster finish on concrete, outlet boxes shall be installed in forms at exact dimensions from bench marks, columns, walls or floors.

G. Where lighting fixtures and appliances outlets are to be mounted on masonry walls and/or plastered furring or other finish, outlet boxes shall be roughed in to general location before installation of wall and furring and shall be reset to exact dimensions before walls and furring are constructed.

H. All outlet boxes shall be set true to horizontal and vertical lines parallel to walls, floors and ceilings and true to finish lines. All boxes shall be secured to ceilings or walls so all installations are solidly mounted.

I. Boxes mounted to metal studs shall be mounted with Caddy #MSF metal stud clip, or equal as approved by the Engineer. Boxes mounted to either metal or wood studs shall be mounted with Caddy #7666 farside box support, or equal as approved by the Engineer. Single metal stud box clips without box supports are not acceptable for mounting boxes.

J. Boxes for exterior or wet location exposed work (where approved by the engineer) shall be Appleton or Pyle National Type FS or FSC for shallow devices and Type FD or FDC for deep devices. Boxes for ceiling mounted light fixtures shall have approved no-bolt fixture studs. Boxes used as junction boxes shall have beveled edge flat steel blank cover.

K. Where outlet boxes are mounted exposed in unfinished areas, (where approved by the engineer) surface mounted boxes shall be 4-inches square, have rounded corners and 1/2-inch raised steel cover plates.

L. Location of outlets on small drawings is approximate and exact dimensions for locations of outlets shall be as taken from large scale plans and details on drawings or as directed by the Architect/Engineer. Outlets shall be located generally from column centers and finished wall lines or to center of wall or joints between wall panels. Ceiling outlets shall be installed at elevation of suspended ceiling connected to outlets in ceiling or slab above. Where necessary to fit and center with panel or ceilings and wall spaces, the contractor must, at no expense the Owner, shift the lighting outlets or other outlets as required by the Architect.

M. Bracket lights over mirrors shall be centered on mirrors with 2-inch fixture clearance above mirror.

N. Boxes for switches and receptacles installed in columns shall be located off center to allow for future partitions.

O. Boxes for switches at or near door shall be installed on the side opposite the hinge. Verify door swing direction prior to rough-in.

P. To prevent sound from traveling through walls, electrical devices from different rooms shall not be mounted in the same stud place. Through-wall boxes shall not be used. In fire rated walls or partitions, outlet boxes on opposite sides of walls or partitions shall be separated by a horizontal distance of 24-inches. Outlet boxes larger than 4-inch square shall not be installed in fire rated walls or partitions, unless contractor provides fire barrier pads around outlet boxes to maintain fire rating of walls or partitions. Verify location of fire rated walls or partitions with Architectural drawings prior to rough-in.

Q. Mark all junction boxes and pull boxes with panel, circuit number, and voltage.

R. All floor boxes shall be cleaned of all construction debris and dirt.

S. Where fire rated 'poke-through' devices are specified, Contractor shall install devices after concrete pour and after final verification of location with Owner. Fire

rated ‘poke-through’ devices shall be spaced apart from each other as required by the manufacturer and U.L.

T. Sectional boxes shall not be used except where directed and approved by the Architect for installation in non-plastered tile walls and provided conduit connections are installed concealed in walls.

U. Install all outlets in a secure and substantial manner and locate so as to be compatible with space, construction and equipment requirements and with the work of the other trades.

V. Furnish and install plaster rings for all boxes installed in plastered (or gyp board) ceilings and walls. Verify construction with general construction drawings.

W. Boxes for switches at or near doors shall be installed on the side opposite the hinge and within 6” of the door. Verify door swing direction prior to rough-in.

X. Rough-in outlets for electric water coolers so as to be concealed behind coolers, but remain accessible, in accordance with recommendation of equipment supplier.

Y. Provide blank cover plates for all outlet boxes not used. Plates in finished areas shall match those specified for switch and receptacle devices. Blank cover plates for junction boxes supplied from the emergency system or fire alarm system shall be painted red.

END OF SECTION 260533

# SECTION 262413 – SWITCHBOARDS

## PART 1 - GENERAL

### 1.1 DESCRIPTION:

A. This section includes the furnishing, installation, and connection of the distribution switchboards.

B. Furnish and install where so indicated a dead front type, completely metal enclosed, self-supporting structure (independent of wall supports) of the required number of vertical sections each bolted together to form one rigid switchboard. The switchboards shall be NEMA 1 non-walk-in construction. Switching and protective devices of the number, rating and type shown on the drawings with the necessary interconnections, instrumentation and control wiring shall be incorporated.

### 1.2 SUBMITTALS:

A. Product Data: For each type of switchboard, overcurrent protective device, transient voltage suppression device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

B. Simultaneous Action Submittals: The following action submittals shall be made in conjunction with the approval process for system protective devices specified in other Division 26 Sections. The following submittals shall be submitted concurrently and shall be in digital form to the engineer for review of compliance:
   1. 260573 – Overcurrent Protective Device Coordination Study. This shall include the coordination study input data, circuit breaker curves, study/equipment evaluation reports, and recommended circuit breaker settings.
   2. 262413 – Switchboards
   3. 262416 – Panelboards
   4. 263213 – Packaged Engine Generators (Diesel)
   5. 263623 – Automatic Transfer Switches

C. Shop Drawings: For each switchboard and related equipment.
   1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
   2. Detail enclosure types for types other than NEMA 250, Type 1.
   3. Detail bus configuration, current, and voltage ratings.
   4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
   5. Include descriptive documentation of optional barriers specified for electrical insulation and isolation.
   6. Detail utility company's metering provisions with indication of approval by utility company.

7. Include evidence of NRTL listing for series rating of installed devices.
8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
9. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.
10. Include diagram and details of proposed mimic bus.
11. Include schematic and wiring diagrams for power, signal, and control wiring.

D. Samples: Representative portion of mimic bus with specified material and finish, for color selection.

E. Field Quality-Control Reports:
1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

F. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
1. Routine maintenance requirements for switchboards and all installed components.
2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
3. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

G. Short Circuit Calculations: The contractor shall engage the services of a qualified firm to perform comprehensive short circuit calculations in accordance with NEC Section 408.6. The results must ensure that all new equipment, including panelboards, switchboards, switchgear, and distribution boards, are properly rated to handle the maximum fault current they may encounter. Proper documentation of these calculations should be provided to verify compliance with NEC requirements. This documentation shall be provided with the gear submittal congruently. If the study is not provided with the gear submittals, the submittal will not be reviewed. The electrical contractor shall also be responsible for field marking all the equipment with the available fault current and the date it was performed. If desired, ICE can provide these comprehensive short circuit calculations as an additional service.

## 1.3 COORDINATION:

A. Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.4 WARRANTY:

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL:

A. Switchboards shall be in accordance with UL, NEMA, NEC, and as shown on the drawings. Switchboard shall be service entrance rated where rating is required by Codes.

B. Switchboards shall be provided complete, ready for operation including, but not limited to housing, buses, circuit breakers, switches, instruments and related transformers, fuses, and wiring.

C. Switchboard dimensions shall not exceed the space provided as shown on the drawings.

2.2 APPROVED MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.: Cutler-Hammer Business Unit
2. Siemens Energy & Automation, Inc.
3. General Electric Company: GE Consumer & Industrial – Electrical Distribution.
4. Square D; a brand of Schneider Electric.

Switchboards shall be by the same manufacturer as the remainder of the distribution equipment on the project. No mixing of manufacturers on the project.

2.3 BASIC ARRANGEMENT:

A. Type II: Switchboard shall be front accessible only (with no installation, renewable, or maintainable parts serviced from the rear), unless noted otherwise on the drawings, with the following features:
1. Device mounting:
a. Main breaker(s)/switch(es): Individually mounted and compartmented.
b. Feeder breaker(s)/switch(es): Panel mounted.

2. Section alignment: As shown on drawings.
3. Accessibility:
    a. Main section line and load terminals: Front.
    b. Distribution section line and load terminals: Front.
    c. Bus connections: Front.

2.4 HOUSING:

A. Switchboard construction shall be of the universal frame type using die formed, welded and bolted members. The sides, top and rear shall be covered with removable screw-on plates. Front plates shall be sectionalized and removable. All plates shall be fabricated from code gauge steel. Ventilation openings shall be provided where required. A flat roof shall be provided to allow for standard conduit exits out of the top of the switchboard in lieu of a sloped roof.

B. Provide ventilating louvers where required to limit the temperature rise of current carrying parts. All openings shall be protected against entrance of falling dirt, water, or foreign matter.

C. Group the meters and their control switches on a hinged front cover. Provide concealed hinges and door secured by screws.

D. All exterior and interior steel surfaces of the switchboard shall be properly cleaned and finished with #49 medium light gray paint over a rust inhibiting phosphatized coating (primer). The finish paint shall be of a type to which field applied paint will adhere. All exterior parts shall be of galvanized steel and all exterior hardware shall be zinc-plated steel.

E. Small wiring, necessary fuse blocks and terminal blocks within the switchboard shall be furnished as required. All groups of control wires leaving the switchboard shall be provided with terminal blocks with suitable numbering strips. All hardware used on conductors shall have a high tensile strength and an anticorrosive plating.

F. Switchboard shall be provided with adequate lifting means and shall be capable of being rolled or moved into installation position and bolted directly to the floor without the use of floor sills.

G. The internal components (switching and protective devices, etc.) shall be removable from the front and shall be individually mounted with the necessary line and load connections easily accessible. Each switching and protective device shall be provided with visible means of ON-OFF identification. All terminals shall be of the anti-turn solderless type suitable for Cu. or Al. cable of the sizes indicated.

H. Vertical sections shall be completely factory assembled, wired and tested before delivery, and shall conform to U.L. and N.E. Code standards and shall be U.L. labeled. Individual vertical sections shall be designed for bolting together at installation site with the only electrical connection being the main cross bus, neutral bus and ground bus. Splice plates shall not be required.

I. If a main breaker is included in the switchboard, ensure the installation of a physical barrier between it and the branch breaker section.

J. General: Buses shall be arranged for 3-phase, 4-wire distribution. Main phase buses (through bus), full size neutral bus, and ground bus shall be full capacity the entire length of the switchboard. Provide for future extensions by means of bolt holes or other approved method. Brace the bus to withstand the available short circuit current at the particular location and as shown on the drawings.

K. Material and Size: Buses and connections shall be silver/tin (except use tin in corrosive locations) plated hard drawn copper of 98 percent conductivity. Bus temperature rise shall not exceed 65 degrees C. Current density shall not exceed 1200 amperes per square inch for copper. Section vertical busing shall be sized based on the sum total of breakers served and UL derating guidelines. Aluminum shall be allowed.

L. Bus Connections: All contact surfaces of copper shall be plated. Provide a minimum of two plated bolts per splice. Where physical bus size permits only one bolt, provide a means other than friction to prevent turning, twisting or bending. Torque bolts to the manufacturer's recommended values. Aluminum shall be allowed.

M. Neutral Bus: Provide bare or plated copper bus and mount on insulated bus supports. Provide neutral disconnect link to permit isolation of neutral bus from the common ground bus and service entrance conductors. Aluminum shall be allowed.

N. Ground Bus: Provide an uninsulated copper equipment ground bus bar sized per UL 891 and of the same material as the length of the switchboard and secure at each section.

O. Main Bonding Jumper: Connect an uninsulated through bus between the neutral and ground buses to establish the system common ground point.

P. A-B-C bus arrangement, left-to-right, top-to-bottom, and front-to-rear, as viewed from the front, shall be used throughout.

Q. Main horizontal buses shall be braced for short- circuit stresses as indicated on the drawings. Interconnecting horizontal bus installed between vertical sections shall not extend within 8" of the top or within 8" of the front, inside any vertical panel section of the switchboard structure.

2.5 PROVISION FOR FUTURE:

A. Where "provision for", "future", or "space" is noted on drawings, the space shall be equipped with bus connections to the future overcurrent device with suitable insulation and bracing to maintain proper short circuit rating and physical clearance. Provide buses and mounting hardware for the ampere rating as shown for the future device. Addition of a breaker/switch in the future shall not require any additional mounting hardware.

2.6 CONTROL WIRING:

A. Control wiring shall be 600-volt Class B stranded SIS. Install all control wiring complete at the factory adequately bundled and protected. Wiring across hinges and between shipping units shall be Class C stranded. Size in accordance with NEC. Provide control circuit fuses.

2.7 MOLDED CASE CIRCUIT BREAKERS: (Only where indicated on the switchboard schedule)

A. Molded case circuit breakers are to be provided only if indicated on the panel schedule on the drawings.

B. Circuit protective devices shall be of the molded case circuit breaker type U.L. listed for A.I.C. ratings as shown on drawing. Frame/Sensor ampere ratings shall be as shown on the drawings.

C. All circuit breakers shall be constructed in accordance with the following standards:
1. UL 489
2. NEMA AB1
3. Federal Specification W-C 375B/GEN
4. CSA 22.2, no. 5-M1986

D. Circuit breaker(s) shall be factory sealed and shall have a date code on the face of the circuit breaker. Poles shall be labeled with respective phase designations.

E. Circuit breaker escutcheon shall have International I/O markings, in addition to standard ON/OFF markings. Circuit breaker handle accessories shall provide provisions for locking handle in the "ON" or "OFF" position.

F. Breaker handle and faceplate shall indicate rated ampacity. Breaker faceplate shall indicate UL and IEC certification standards with applicable voltage systems and corresponding AIC ratings.

G. The continuous ampere rating of the circuit breaker shall be determined by the ampere rating switch position. The ampere rating shall be clearly marked on the face of the circuit breaker.

H. Terminations:
1. All lugs shall be UL Listed to accept solid and/or stranded copper and aluminum conductors. Lugs shall be suitable for 90 degree C rated wire, sized according to the 75 degree C temperature rating in the N.E.C. Lug body shall be bolted in place, snap-in designs are not acceptable.
2. The gear manufacturer shall be responsible for verifying that the lugs provided are properly sized to accommodate the feeders as indicated on the drawings, ensuring compliance with all applicable codes and standards.
3. All circuit breakers shall be UL Listed to accept field installable/removeable mechanical type lugs.
4. All circuit breakers shall be suitable for bus connection.

2.8 ELECTRONIC TRIP 80% RATED CIRCUIT BREAKERS: (Only where indicated on the switchboard schedule)

A. Where indicated in the schedule on the drawings, circuit breakers shall be Electronic Trip Molded Case Circuit Breakers.

B. Circuit breaker(s) shall utilize a glass reinforced insulating material providing high dielectric strength. Current carrying components are to be completely isolated from the trip unit and accessory mounting area. Common tripping of all poles is required. The circuit breaker(s) shall be UL Listed for reverse connection without requiring special construction or labeling.

C. Each circuit breaker shall be equipped with a push-to- trip button to mechanically operate the circuit breaker tripping mechanism. Each breaker shall have quick-make, quick-break contacts with an overcenter toggle operating mechanism. Breaker(s) shall not be able to be teased into a neutral position. All circuit breakers shall be equipped with electrical accessories as noted on the drawings.

D. The entire trip system shall be a microprocessor-based, peak sensing design. MICROLOGIC standard function as manufactured by Square D or approved equivalent is acceptable.

E. The integral trip system shall be independent of any external power source and shall contain electronic components to measure ampacity and time the output from internal current sensors and initiate automatic tripping action.

F. Provide a Fixed Instantaneous (High Level Selective Override) circuit on circuit breaker(s) with a defeatable instantaneous adjustment to allow the circuit breaker to remain closed for up to 30 cycles during overcurrents below the RMS symmetrical short time withstand ratings and to trip instantaneously when current levels exceed applicable withstand ratings.

G. Provide a means to seal the trip unit adjustments to discourage unauthorized tampering in accordance with NEC 240-6.

H. Provide the following time/current curve profile adjustment(s) to maximize system selective coordination. Each adjustment shall have discrete settings and shall be independent from all other adjustments.
1. Adjustable Ampere Rating Pickup and Delay
2. Adjustable Instantaneous Pickup
3. High Level Selective Override
4. Adjustable Ground Fault Pickup and Delay (delay includes I squared t OUT)

I. Provide local visual trip indicators for overload, short circuit and ground fault trip functions.

J. The trip system shall include a memory circuit to detect intermittent overcurrent conditions.

K. Each circuit breaker trip system is to include an externally accessible test port for use with a Universal Test Set.

L. Provide magnetic/thermal backup for all electronic trip circuit breakers.

2.9 INSTRUMENTATION:

A. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:
1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:
a. Phase Currents, Each Phase: Plus or minus 1 percent.
b. Phase-to-Phase Voltages, Three Phase: Plus or minus 1 percent.
c. Phase-to-Neutral voltages: Three Phase: Plus or minus 1 percent.
d. Megawatts: Plus or minus 2 percent.
e. Megavars: Plus or minus 2 percent.
f. Freqency: Plus or minus 0.5 percent.
g. Accumulated Energy: Megawatt Hours: Plus or minus 2 percent, accumulated values unaffected by power outages up to 72 hours.
h. Megawatt Demand: Plus or minus 2 percent; demand interval programmable from five to 60 minutes.
i. Contact devices to operate remote impulse-totalizing demand meter.
2. Mounting: Display and control unit flush or semiflush mounted in instrument compartment door.

2.10 MISCELLANEOUS DEVICES:

A. Key interlocks shall be provided as indicated on the drawings.

B. Each NEMA 3R section of the switchgear shall be provided with a space heater thermostatically controlled. Power for the space heater shall be obtained from a control power transformer within the switchgear. Supply voltage shall be 120V AC and served from a normal power circuit. The switchgear shall be provided with a bottom steel plate and rodent barriers.

2.11 EQUIPMENT GROUND FAULT PROTECTION (Where indicated on the switchboard schedule or required by code):

A. Equipment ground fault protection shall be provided only if indicated on the panel schedule on the drawings or where required by the National Electrical Code (NEC). If required by code (1,000 amps or larger on a 480V/277 3 phase system), the contractor shall provide equipment ground fault protection on the service disconnecting means regardless if it is shown on the drawings or not.

B. Each main circuit breaker or main switch 1,000 amps and larger on 480V/277 3 phase system shall be provided with integral equipment protection for grounded systems. These circuit breaker or switch shall be suitable for use on three phase circuits where the neutral is grounded but not carried through the switchboard, or on three phase, four wire systems.

C. The ground fault sensing system shall be of residual type.

D. The ground fault system shall include a memory circuit for positive tripping action despite intermittent arcing ground faults.

E. Provide an integral means of testing the ground fault system to meet the on-site requirements of NEC.

F. Provide a separate neutral current transformer for three phase, four wire systems as shown.

G. Coordination of ground fault system settings shall be as per the manufacturers requirements.

2.12 ARC FLASH MITIGATION (Where indicated on the switchboard schedule or required by code):

A. Overcurrent devices that are 1,200 amp and larger, or can be adjusted to 1200A, shall be provided with an Arc flash Reduction Maintenance System Technology capability. The Arc flash Reduction Maintenance System shall allow the operator to enable a maintenance mode using a 5 position switch which enables a preset accelerated instantaneous override trip to reduce arc flash energy. A blue LED on the trip unit shall indicate the trip unit is in the maintenance mode. If required by code (1,200 amps on overcurrent devices on projects that are permitted under the 2017 NEC), the contractor shall provide Arc flash reduction maintenance system technology capability on those overcurrent devices regardless if it is shown on the drawings or not. Documentation shall be provided by the equipment manufacture to demonstrate that the energy-reducing maintenance switch is set to operate at a value below the available arcing current. This documentation shall be provided with the gear submittal congruently. The electrical contractor shall be responsible for the arc energy reduction performance testing per NEC 240.87(C). A written record of this testing shall be made available to the AHJ.

2.13 SURGE SUPPRESSION DEVICES:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.: Cutler-Hammer Business Unit
2. Siemens Energy & Automation, Inc.
3. General Electric Company: GE Consumer & Industrial – Electrical Distribution.
4. Square D; a brand of Schneider Electric.

B. Surge Protection Device Description: IEEE C62.41-compliant, integrally mounted, plug-in solid-state, parallel-connected, modular (with field-replaceable modules) type, with sine-wave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the switchboard short-circuit rating, and with the following features and accessories:
1. Fuses, rated at 200-kA interrupting capacity.

2. Fabrication using bolted compression lugs for internal wiring.
3. Integral disconnect switch.
4. Redundant suppression circuits.
5. Redundant replaceable modules.
6. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
7. LED indicator lights for power and protection status.
8. Audible alarm, with silencing switch, to indicate when protection has failed.
9. Form-C contacts rated at 5 A and 250-VAC ac, one normally open and one normally closed, for remote monitoring of system operation. Contacts shall reverse position on failure of surge diversion module or an opening of any current-limiting device. Coordinate with building power monitoring and control system.
10. Six-digit, transient-event counter set to totalize transient surges.

2.14 Breaker Coordination: The Gear Manufacture shall provide a coordination study for the main breaker and the largest downstream breaker located in the service entrance gear for electrical services equal to or greater than 1,000 amps. The coordination study shall include a time-current curve drawing with recommended settings. The coordination study shall be provided with the gear submittal congruently. The contractor shall be responsible for adjusting the main breaker settings to match the coordination study suggestions.

2.15 If required by the AHJ, the electrical contractor shall be responsible for providing an allowance for ground-fault and arc energy reduction performance testing when required by the 2020 National Electric Code. The testing shall be performed after the equipment is installed on site. The Ground fault and arc energy reduction protection system shall be performance tested by primary current injection testing. This testing shall be conducted by a qualified person(s) in accordance with the manufacturer's instructions. A written record of this testing shall be made and shall be available to the authority having jurisdiction. All written documents shall be submitted to engineer of record as required.

## PART 3 - EXECUTION

### 3.1 INSTALLATION:

A. Install switchboards in accordance with the NEC, as shown on the drawings, and as recommended by the manufacturer.

B. Install a 3-1/2 inch high concrete housekeeping pad under all switchboards.

C. Anchor switchboards to the floor with plated 1/2-inch minimum anchor bolts as recommended by the manufacturer.

D. Enclosures are to be of the NEMA types shown on the drawings. Where the types are not shown, they are to be the NEMA type most suitable for the environmental conditions where the equipment is to be installed.

E. In addition to switchboard nameplate, provide a nameplate on the face of the switchboard lettered: “WARNING, POTENTIAL ARC-FLASH HAZARDS EXIST WHILE WORKING ON THIS ENERGIZED EQUIPMENT”. All switchboards shall also have a nameplate for each circuit breaker or fusible switch indicating load served.

F. No piping, ductwork, or equipment foreign to the electrical installation shall be located in the electrical distribution equipment dedicated space as defined in N.E.C. Article 110.26 (F) (1). The Mechanical Contractor and Fire Sprinkler System Contractor shall locate ductwork and piping to clear the electrical distribution equipment dedicated space.

END OF SECTION 262413

# SECTION 262416 - PANELBOARDS

## PART 1 - GENERAL

### 1.1 DESCRIPTION:

A. This section includes the furnishing, installation and connection of panelboards.

### 1.2 SUBMITTALS:

A. Submit product data and shop drawings in accordance with Division 01 and Division 26 Sections “Common Work Results for Electrical” for products specified under Part 2 - PRODUCTS.

B. Simultaneous Action Submittals: The following action submittals shall be made in conjunction with the approval process for system protective devices specified in other Division 26 Sections. The following submittals shall be submitted concurrently and shall be in digital form to the engineer for review of compliance:
   1. 260573 – Overcurrent Protective Device Coordination Study. This shall include the coordination study input data, circuit breaker curves, study/equipment evaluation reports, and recommended circuit breaker settings.
   2. 262413 – Switchboards
   3. 262416 – Panelboards
   4. 263213 – Packaged Engine Generators (Diesel)
   5. 263623 – Automatic Transfer Switches

C. Product Data: For each type of panelboard, overcurrent protection device, accessory, and related component, include the following:
   1. Manufacturers’ technical data on features, performance, electrical characteristics, ratings, and finishes.
   2. Rated capacities, features, operating characteristics, furnished specialties, factory settings, accessories, and time-current characteristic curves for individual relays and overcurrent protective devices.
      a. Time-current curves for each type of overcurrent protection device. Include hard copy of characteristic curve and TCC Number for use with Power Tools by SKM Systems Analysis, Inc. Indicate available setting points and selectable ranges for each type of adjustable overcurrent protection device.

D. Shop Drawings: For each panelboard and related equipment, include the following:
   1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show method of field assembly and location and size for each field connection. Include the following:
      a. Tabulation of installed devices with features and ratings.
      b. Enclosure types and details.
      c. Outline and general arrangement drawing showing dimensions, shipping sections, and weights of each assembled section.

d. Bus configuration with size and number of conductors in each bus run, including phase, neutral, and ground conductors of main and branch buses.
e. One-line diagram.
f. Bus current and voltage ratings.
g. Short-time and short-circuit current rating of equipment assembly.
h. Feeder entry locations and lug configuration.
i. Elevation drawing showing locations for anchor bolts.
j. Nameplate legends.

2. Wiring Diagrams: For each type of panelboard and related equipment, include the following:
   a. Power, signal, and control wiring.

E. Coordination Drawings: Submit Coordination Drawings in accordance with Division 26 Section “Common Work Results for Electrical” for each location where panelboards are included in the Work.

F. Panelboard Directories: For installation in panelboard.

G. Field quality-control Test Method and Procedure: List of procedures to be used during functional and operations sequence testing. Method of Procedure should include but not be limited to the following:
1. Tabulation of Testing Equipment and PPE required for tests.
2. Schedule of Shutdowns required.
3. Manufacturer’s Recommended Pre-Start Checklists for the following:
   a. Overcurrent Protection Devices
4. Step-by-Step Testing Operations and Criteria for tests listed in Part 3 Paragraph “Field quality-control”.

H. Field quality-control test reports including the following:
1. Test results that comply with requirements.
2. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

I. Operation and Maintenance Data: For electrical equipment, accessories and components to be included in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
1. Manufacturer's routine maintenance requirements for panelboard and all installed components.
2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
3. Time-current curves, including selectable ranges for each type of relay and overcurrent protective device. Include directory listing each adjustable breaker included in the Work and their final set points.
4. Manufacturer's sample system checklists and log sheets.

J. Short Circuit Calculations: The contractor shall engage the services of a qualified firm to perform comprehensive short circuit calculations in accordance with NEC Section 408.6. The results must ensure that all new equipment, including panelboards, switchboards, switchgear, and distribution boards, are properly rated to handle the maximum fault current they may encounter. Proper documentation of these calculations should be provided to verify compliance with NEC requirements.

This documentation shall be provided with the gear submittal congruently. If the study is not provided with the gear submittals, the submittal will not be reviewed. The electrical contractor shall also be responsible for field marking all the equipment with the available fault current and the date it was performed. If desired, ICE can provide these comprehensive short circuit calculations as an additional service.

## PART 2 - PRODUCTS

### 2.1 PANELBOARDS:

A. Panelboards shall be in accordance with UL, NEMA, NEC, and as shown on the drawings. Panelboards shall be by the same manufacturer as the remainder of the distribution equipment on the project. No mixing of manufacturers on the project. Approved manufacturers shall be as follows:

| Panelboard Type | Square 'D' | Siemens ITE | General Electric | Cutler-Hammer |
|---|---|---|---|---|
| Branch Circuit Panelboard 240V | NQ | P1 | AL/AQ | PRL1X |
| Branch Circuit Panelboard 480V | NF | P1 | AE | PRL2X |
| Circuit Breaker Distribution Panelboard | I-Line | P5 | Spectra | PRL3X |
| Fusible Distribution Panelboard | QMB | P5 | QMR | PRL4F |

B. Branch circuit and distribution panelboards rated up to 240V (400A. max) shall have a short circuit current rating tested to U.L. Standards for a minimum rating of 10,000 A.I.C. unless noted otherwise. Breaker rating with-in panel shall be equal to or greater than minimum integrated equipment rating. Series ratings will not be accepted, unless specifically noted otherwise on the drawings. All breakers shall be of either the plug-in type or bolt-on type.

C. Branch circuit and distribution panelboards rated over 240V and up to 480V (400A max) shall have a short circuit current rating tested to U.L. Standards for a minimum rating of 14,000 A.I.C. unless noted otherwise. Breaker rating with-in panel shall be equal to or greater than minimum integrated equipment rating. Series ratings will not be accepted, unless specifically noted otherwise on the drawings. All breakers shall be of the bolt-on type only.

D. Distribution panelboards located in finished rooms (other than mechanical, electrical or janitor rooms) shall be provided with key locking doors.

E. Provide standard manufactured products. All components of panelboards shall be the product and assembly of the same manufacturer. All similar units of all panelboards to be of the same manufacturer.

F. All panels shall be dead front safety type. Arrange sections for easy removal without disturbing other sections. All distribution panels in finished areas shall be provided with key locking doors. All panels in finished areas shall be recessed with flush type covers.

G. All panelboards shall be completely factory assembled with molded case circuit breakers or switches.

H. Panels shall have main breaker/switch or main lugs, bus size, voltage, phase, top or bottom feed, and flush or surface mounting as scheduled on the drawings.

I. Panelboards shall have the following features:
   1. Non-reduced size tin plated copper bus bars (phase and neutral), and copper connection straps bolted together and rigidly supported on molded insulators. Bus bar tops for panels with single pole branches shall be arranged for sequence phasing of branch circuit devices. All lugs shall be AL/CU rated.
   2. The gear manufacturer shall be responsible for verifying that the lugs provided are properly sized to accommodate the feeders as indicated on the drawings, ensuring compliance with all applicable codes and standards.
   3. Full size neutral bar shall be mounted on insulated supports. Provide 200% neutral bar for panels fed from K-rated transformer or as shown on drawings. Minimum number of lugs shall be equal to 90% of number of pole spaces in the panelboard, except in computer rated panelboards or isolated ground panelboards provide 100% of pole space lugs. Each neutral conductor shall be terminated under a separate lug.
   4. Copper ground bar with sufficient terminals for all grounding wires. Minimum number of lugs shall be equal to 90% of number of pole spaces in the panelboard, except in computer rated panelboards or isolated ground panelboards provide 100% of pole space lugs. Each ground conductor shall be terminated under a separate lug.
   5. Distribution panels located in finished rooms (other than mechanical, electrical rooms or janitor rooms) shall be provided with key locking doors.
   6. All breakers and phase bus connections shall be arranged so that it will be possible to substitute a 2-pole breaker for two single pole breakers, and a 3-pole breaker for three single pole breakers, when trip is 100 amps or less without having to drill and tap the main bus bars at bus straps.
   7. Design interior so that protective devices can be replaced without removing adjacent units, main bus connectors, and without drilling or tapping. Panel phase bus connections to protective devices shall not be riveted to the panel bus and shall be field removable by means of a screw driver.
   8. Where designated on panel schedule as "space", include all necessary bussing, device support, and connections. Provide blank cover for each space.
   9. In two section panelboards, the main bus in each section shall be full size. The first section shall be furnished with subfeed lugs on the line side or feed through lugs on the load side with cable connections to the second section. Panelboard sections with tapped bus or crossover bus shall not be accepted.
   10. Electrical Contractor shall coordinate lug quantities with the number of feeder conductors serving panelboard.
   11. All panelboards serving devices having isolated ground circuits shall be provided with an additional insulated copper ground bus for connection of isolated ground conductors.

2.2 CABINETS AND TRIMS:

A. Cabinets:
1. Provide galvanized steel cabinets to house panelboards. Cabinets for distribution panels may be factory primed and suitable treated with a corrosion-resisting paint finish meeting UL standard for outdoor applications.
2. Cabinet enclosure shall not have ventilating openings (225A. and less).
3. Back and sides shall be of one piece formed steel. Cabinets for distribution panels may be of formed sheet steel with end and side panels welded, riveted, or bolted as required.
4. Provide minimum of four interior mounted studs and necessary hardware for "in" and "out" adjustment of panel interior.
5. Flush mounted cabinets for two section panelboards shall have both sections bolted together, arranged side by side, shall be the same height and should be 1-1/2 inches apart and coupled by conduit nipple.
6. Gutter size in panel boxes, on all sides, shall be in accordance with the NEC. Cabinets containing through feeders shall have the gutters space increased by the amount required for auxiliary gutters in the NEC.

B. Trims and doors:
1. Panels shall have hinged covers with concealed trim clamps, doors shall have laser cut trims with concealed hinges, and flush lock, master keyed. Hinged cover shall have continuous piano hinge down one side with door opening by a single latch.
2. Flush trims shall overlap the box by at least 3/4-inch all around.
3. Surface trim shall have the same width and height as the box. Trim overlap or protruding past the box sides will not be allowed.
4. Flush or surface trims shall not have ventilating openings (225A. and less).
5. Secure trims to back boxes with indicating trim clamps.
6. Provide a welded angle on rear of trim to support and align trim to cabinet.
7. Provide separate trims for each section of multiple section panelboards. Doors of all sections shall be of the same height.
8. All branch circuit panelboards, and distribution panelboards with doors, shall be provided with key locking doors. Furnish two (2) keys for each lock to Owner.
9. Consult the drawings for flush or surface mounted panels.

C. Doors:
1. Provide concealed, butt hinges welded to the doors and trim.
2. For magnetic contactors incorporated in panelboards, provide separate interlocked doors for the contactors.
3. Provide keyed alike system for all panelboards.
4. Provide a typed directory card and metal holder, with transparent cover. Permanently mount holders on inside of doors.

D. Painting:
1. Thoroughly clean and paint trims and doors at the factory with primer and manufacturer's standard finish.

2.3 MOLDED CASE CIRCUIT BREAKERS FOR PANELBOARDS:

A. Breakers shall be UL listed and labeled, in accordance with the NEC, as shown on the drawings, and as specified.

B. Circuit breakers in panelboards shall be securely attached to the phase bus bar or branch circuit bar using the manufacturers standard method of attachment.
   1. Molded case circuit breakers shall have automatic, trip free, non-adjustable, inverse time, and instantaneous magnetic trips for 100 ampere frame or less. Magnetic trip shall be adjustable for breakers with 400 ampere frames and higher. Factory setting shall be used, unless otherwise noted.
   2. Molded case circuit breakers for lighting circuits shall be switching duty rated and suitable for use on HID lighting circuits.
   3. Ground fault circuit interrupter breakers (GFCI) for breakers less than 60 Amp shall be personnel protection (Class A) rated at 5 ma trip unless otherwise specified as equipment protection.
   4. If GFCI circuit breakers with the required AIC rating are not available, the electrical contractor shall furnish and install a third-party GFCI protection device that meets all applicable NEC requirements and is approved by the Engineer. The third-party GFCI device shall be equal to LineGard GFCI devices or an equivalent UL-listed GFCI solution designed for the application.

C. Breaker features shall be as follows:
   1. A rugged, integral housing of molded insulating material.
   2. Silver alloy contacts.
   3. Arc quenchers and phase barriers for each pole.
   4. Quick-make, quick-break, operating mechanisms.
   5. A trip element for each pole, thermal magnetic type with long time delay and instantaneous characteristics, a common trip bar for all poles and a single operator.
   6. Electrically and mechanically trip free.
   7. An operating handle which indicates ON, TRIPPED, and OFF positions.
   8. Line connections shall be bolt-on.
   9. An overload on one pole of a multi-pole breaker shall automatically cause all the poles of the breaker to open.

D. Where new circuit breakers are noted on the drawings to be installed in existing panelboards, verify and coordinate the circuit breaker type and manufacturer with the existing panelboard.

2.4 SEPARATELY ENCLOSED MOLDED CASE CIRCUIT BREAKERS:

A. Where separately enclosed molded case circuit breakers are shown on the drawings, provide circuit breakers in accordance with applicable requirements of those specified for panelboards.

B. Enclosures are to be of the NEMA types shown on the drawings. Where the types are not shown, they are to be the NEMA type most suitable for the environmental conditions where the breakers are being installed.

2.5 SURGE ARRESTOR:

A. If shown on the drawings, provide an integralsurge arrestor for lightning protection. Refer to the drawings for voltage and phasing of service. Arrestor shall be located within or adjacent to the switchboard enclosure and connected with 12” maximum leads.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Installation shall be in accordance with NEC, as shown on the drawings, and as specified.

B. Where flush mounted panels occur on drawings contractor shall stub into nearest accessible ceiling void for future use, (1) 1 inch empty conduit for every four spare 20A. breakers or four unused panel spaces. For panels located on multi-floor buildings, conduits shall be stubbed into accessible ceilings both above and below panel. Conduits stubbed into ceiling void below panel shall be provided with conduit cap and labeled “To Panel Above”.

C. Locate panelboards so that the present and future conduits can be conveniently connected. Coordinate the sizes of cabinets with designated closet space.

D. After wiring, label each circuit and install a typewritten schedule of circuits in each panelboard after approval by the Engineer. Schedule shall be typed on the paper directory cards. Include the room numbers and items served on the cards. Schedule shall indicate as-built conditions if circuiting is installed different than shown on the drawings. Schedule shall indicate final room numbering approved by Owner. Mark spare circuit breakers, and provisions for future circuit breakers, in pencil on schedule for future circuit marking.

E. Mount the panelboard so that maximum height of circuit breaker or switch above finished floor shall not exceed 78 inches. For panelboards which are too high, mount panelboard so that the bottom of the cabinets will not be less than six inches above the finished floor.

F. For panelboards located in areas accessible to the public, paint the exposed surfaces of the trims, doors, and boxes with finishes to match surrounding surfaces after the panelboards have been installed.

G. Other than minor deviations approved by the Engineer, provide circuit breaker arrangement in panelboards to match circuit numbering on the drawings.

H. All electrical distribution equipment (switchboards, panelboards, disconnect switches, transformers, starters, etc.) shall be of one manufacturer, unless specifically noted on the drawings, in the specifications, or approved by the Engineer. Intermixing of distribution equipment by different manufacturers will not be permitted.

I. If layout changes are required due to other electrical manufacturers equipment size, they must be submitted to and approved by the Engineer prior to bidding. National Electric Code working clearances must be maintained at all times. In no case will extra remuneration be allowed for layout changes that differ from those shown.

J. All items of distribution equipment required to be floor mounted shall be mounted on a minimum 3 1/2" concrete base above floor. Concrete base to be by Electrical Contractor.

K. Panel schedules are not shown on the drawings, however, copies of these schedules are available to the successful Contractor after bids are let, upon request to the Engineer.

L. Enclosures are to be of the NEMA types shown on the drawings. Where the types are not shown, they are to be the NEMA types most suitable for the environmental conditions where the equipment is to be installed.

M. All panelboards supplied from an emergency source shall have breakers provided with handle lock-off for each breaker. Breaker handles to be set in the "ON" position.

N. Turn all spare circuit breakers in panelboards to off position.

O. In addition to panel nameplate, provide a nameplate on the face of each branch circuit or distribution panel lettered: “WARNING, POTENTIAL ARC-FLASH HAZARDS EXIST WHILE WORKING ON THIS ENERGIZED EQUIPMENT”. All distribution panels shall also have a nameplate for each circuit breaker or fusible switch indicating load served if the distribution panel is not furnished with a circuit directory.

P. No piping, ductwork, or equipment foreign to the electrical installation shall be located in the electrical distribution equipment dedicated space as defined in N.E.C. Article 110.26 (F) (1). The Mechanical Contractor and Fire Sprinkler System Contractor shall locate ductwork and piping to clear the electrical distribution equipment dedicated space.

END OF SECTION 262416

# SECTION 262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

## PART 1 - GENERAL

### 1.1 DESCRIPTION:

A. This section includes all low voltage disconnect switches either stand alone in NEMA enclosures, fusible and non-fused, in panelboards, switchboards, or switchgear.

### 1.2 MANUFACTURERS:

A. Approved Manufacturers
   1. Square 'D'
   2. General Electric
   3. Siemens/ITE
   4. Cutler Hammer

B. Disconnect switches shall be by the same manufacturer as the remainder of the distribution equipment on the project. No mixing of manufacturers on the project.

## PART 2 - PRODUCTS

### 2.1 LOW VOLTAGE FUSIBLE SWITCHES RATED 800 AMPERES AND LESS:

A. Quick-make, quick-break type in accordance with UL 98, NEMA KS 1 and NEC.

B. Shall be capable of accepting UL and NEMA standard fuses.

C. Shall have the following features:
   1. Switch mechanism shall be the quick-make, quick-break type.
   2. Copper blades, visible in the OFF position.
   3. An arc chute for each pole.
   4. External operating handle shall indicate ON and OFF position and shall have lock-open padlocking provisions.
   5. Mechanical interlock shall permit opening of the door only when the switch is in the OFF position, defeatable by a special tool to permit inspection.
   6. Fuse mounting for the size and type of fuses specified. Furnish switches completely fused. Furnish a complete set of spare fuses for each size and type of fuse being installed.
   7. Solid neutral for each switch being installed in a circuit which includes a neutral conductor.
   8. Enclosures:
      a. Shall be NEMA 1 for interior, NEMA 3R for exterior and other types shown on the drawings for the switches.
      b. Where the types of switch enclosures are not shown, they shall be the NEMA types which are most suitable for the environmental conditions where the switches are being installed.

9. All fuse holders shall have rejection features to reject all fuses not specified. Provide fuse rejection kits as required.

D. Unless indicated otherwise, switches shall be heavy duty, horsepower rated for the load served, and provided with ground kit.

E. Disconnect switches shall be fused except for disconnect switches that have individual fuse protection at point circuit receives its supply.

F. Provide dead front type for all exterior disconnects on grade level when so required by local code.

G. All fused disconnect switches shall have a minimum rating of 100,000 A.I.C. with fuses installed unless noted otherwise on the drawings.

2.2 LOW VOLTAGE UNFUSED SWITCHES RATED 800 AMPERES AND LESS:

A. Shall be the same of Low Voltage Fusible Switches rated 800 amperes and less, except it shall not accept fuses.

2.3 THERMAL OVERLOAD SWITCHES:

A. Provide/install toggle type switches, voltage and horsepower rated for the load served 20 or 30 Amp for all small mechanical equipment as indicated.

2.4 FUSES:

A. This paragraph applies to all fuses provided under Division 26.
1. Cartridge type fuses of proper size and type as required shall be furnished and installed for all switches and panelboards throughout and an additional supply of three spare fuses of each size and type shall be furnished in original packages to the Owner. Furnish NEMA 1 enclosure with hinged cover equal to Bussmann Type SFC or Edison ESFC, for storing all spare fuses located adjacent to main service equipment. Fuses for motor and mechanical equipment shall be sized per nameplate data and N.E.C.
2. Fuses shall be manufactured by Bussmann Mfg. Co., Ferraz-Shawmut Co., Littelfuse or approved equal by Engineer. Fuse types shall be installed as follows:

Main Service and Distribution Feeder Protection:

| | Bussman | Littelfuse | Ferraz Shawmut |
|---|---|---|---|
| 601 amps and larger<br>600 volts and less (Class L) | KRP-C/KTN | KLPC | A4BQ |
| 600 amps and less | LPN-RK | LLN-RK | A2D-R |

250 volts and less (Class RK1)

| | | | |
|---|---|---|---|
| 600 amps and less<br>600 volts and less (Class RK1) | LPS-RK | LLS-RK | A6D-R |

Motors and Primary Feeders for Transformers:

| | | | |
|---|---|---|---|
| 250 volts and less<br>(Class RK5) | FRN-R | FLN-R | TR-R |
| 600 volts and less<br>(Class RK5) | FRS-R | FLS-R | TRS-R |

3. Class T fuses will not be accepted, unless they are a part of a manufacturers assembly or approved by the Engineer. Class J fuses may be used as an alternate to the Class R fuses listed above.
4. Fuses installed on project shall be by one manufacturer only. (Do not intermix Manufacturers.)

2.5 EQUIPMENT CONNECTIONS:

A. For 120 volt motors 1/2 HP- and less, 15 amperes and less, Contractor shall provide Bussmann "SSY" box cover unit for indoor application and "SSN" box cover unit for outdoor applications, or equal by Perfect-Line, with fustat plug fuse and integral toggle switch for motors 1/2 HP-120V. and less. Fustats for cord and plug equipment with fuses 15 amperes and less shall be Bussmann “SRY” box cover unit, or equal by Perfect-Line, with fustat plug fuse. Mount fustats in housings of equipment served wherever possible. Plug fuses for motors shall be sized based upon 125% of manufacturer's nameplate full load amperage unless otherwise indicated on drawings.

B. For 3/4 HP-120V. motors, Contractor shall provide (1) 20 amp 1 pole 120 volt toggle disconnect switch with a Bussmann ‘HPD’ fuse holder and ‘FNQ-R’ fuse at each unit. Switch and fuse holder to be mounted in cover of a 4” square, 2 1/8” deep junction box at each unit. For 3/4 HP-120V. motors that are provided with cord and plug, Contractor shall provide 20 amp 120 volt duplex receptacle with (1) 20 amp 1 pole 120 volt toggle disconnect switch on line side of receptacle, and Bussmann ‘HPD’ fuse holder and ‘FNQ-R’ fuse on line side of receptacle. Switch, receptacle, and fuse holder to be mounted in cover of a 4” square, 2 1/8” deep junction box at each unit. Fuses for motors shall be sized based upon 125% of manufacturer's nameplate full load amperage unless otherwise indicated on drawings.

C. For connections to 277 volt equipment, Contractor shall provide (1) 20 amp 1 pole 277 volt toggle disconnect switch with a Bussmann ‘HPD’ fuse holder and ‘FNQ’ fuse at each unit. Switch and fuse holder to be mounted in cover of a 4” square, 2 1/8” deep junction box at each unit. Fuses for motors shall be sized based upon 125% of manufacturer's nameplate full load amperage unless otherwise indicated on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Installation shall be in accordance with the NEC and as shown on the drawings.

B. Enclosures shall be of the NEMA types shown on the drawings. Where the NEMA type is not shown, they are to be the NEMA type most suitable for the environmental conditions where the equipment is to be installed.

C. No piping, ductwork, or equipment foreign to the electrical installation shall be located in the electrical distribution equipment dedicated space as defined in N.E.C. Article 110.26 (F) (1). The Mechanical Contractor and Fire Sprinkler System Contractor shall locate ductwork and piping to clear the electrical distribution equipment dedicated space.

END OF SECTION 262816